UNIVERSITY OF TORONTO

CALENDAR OF THE FACULTY
OF
APPLIED SCIENCE AND ENGINEERING
1925-1926

UNIVERSITY OF TORONTO PRESS

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1925 CALENDAR 1925

JANUARY

Sun.		4	11	18	25
Mon.		5	12	19	26
Tues.		6	13	20	27
Wed.		7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	31

FEBRUARY

Sun.	1	8	15	22
Mon.	2	9	16	23
Tues.	3	10	17	24
Wed.	4	11	18	25
Thur.	5	12	19	26
Fri.	6	13	20	27
Sat.	7	14	21	28

MARCH

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	31
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

APRIL

Sun.		5	12	19	26
Mon.		6	13	20	27
Tues.		7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	..
Sat.	4	11	18	25	..

MAY

Sun.		3	10	17	24	31
Mon.		4	11	18	25	..
Tues.		5	12	19	26	..
Wed.		6	13	20	27	..
Thur.		7	14	21	28	..
Fri.	1	8	15	22	29	..
Sat.	2	9	16	23	30	..

JUNE

Sun.		7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	..
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

JULY

Sun.		5	12	19	26
Mon.		6	13	20	27
Tues.		7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	31
Sat.	4	11	18	25	..

AUGUST

Sun.		2	9	16	23	30
Mon.		3	10	17	24	31
Tues.		4	11	18	25	..
Wed.		5	12	19	26	..
Thur.		6	13	20	27	..
Fri.		7	14	21	28	..
Sat.	1	8	15	22	29	..

SEPTEMBER

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	..
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

OCTOBER

Sun.		4	11	18	25
Mon.		5	12	19	26
Tues.		6	13	20	27
Wed.		7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	31

NOVEMBER

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	..
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

DECEMBER

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	31
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

1926 CALENDAR 1926

JANUARY

Sun.		3	10	17	24	31
Mon.		4	11	18	25	..
Tues.		5	12	19	26	..
Wed.		6	13	20	27	..
Thur.		7	14	21	28	..
Fri.	1	8	15	22	29	..
Sat.	2	9	16	23	30	..

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Sat.	5	12	19	26	..

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Thur.	2	9	16	23	30
Fri.	3	10	17	24	31
Sat.	4	11	18	25	..

CALENDAR OF THE FACULTY OF APPLIED SCIENCE AND ENGINEERING 1925-1926

Michaelmas Term

1925—July 1 Wednesday. . Dominion Day. University Buildings closed.
Aug. 13 Thursday. . . . Students third year, Dept. 1, report at Summer Survey Camp.
Aug. 20 Thursday. . . . Students third year, Dept. 2, report at Summer Survey Camp.
Sept. 1 Tuesday. . . . . Last day for receiving applications for supplemental examinations.
Sept. 7 Monday. . . . . Labour Day. University Buildings closed.
Sept. 8 Tuesday. . . . . Students fourth year, Astronomy Option, report at Summer Survey Camp.
Sept. 22 Tuesday. . . . . Supplemental examinations commence.
Sept. 29 Tuesday. . . . . Registration in person of the first year.
Sept. 30 Wednesday. . Preliminary instruction to first year.
Registration in person of the second, third and fourth years.
The Dean's address to the first year at 9.30 a.m. in the first year draughting room.
The opening address by the President to the students of all the Faculties at 3 p.m. in Convocation Hall.
Oct. 1 Thursday. . . . Lectures and laboratory work commence at 9 a.m.
Oct. 2 Friday. . . . . . Meeting of Faculty Council.
Oct. 3 Saturday. . . . Stated meeting of the Caput to deal with requests as to social functions until November 15th.
Oct. 9 Friday. . . . . . Interfaculty Track Meet. Neither lectures nor laboratory classes given after 1 p.m.
Meeting of Senate.
Oct. 21 Wednesday. . First meeting of Engineering Society.
Nov. 4 Wednesday. . Meeting of Engineering Society.
Nov. 6 Friday. . . . . . Meeting of Faculty Council.
Nov. 7-9 Saturday-Monday. . Thanksgiving. Neither lectures nor laboratory classes given.
Nov. 13 Friday. . . . . . Meeting of Senate.
Nov. 18 Wednesday. . Meeting of Engineering Society.
Dec. 1 Tuesday. . . . . Last day for receiving applications for supplemental examinations.
Dec. 2 Wednesday. . Meeting of Engineering Society.
Dec. 4 Friday. . . . . . Meeting of Faculty Council.
Dec. 11 Friday. . . . . . Meeting of Senate.
Dec. 22 Tuesday. . . . . Last day of lectures. Term ends at 5 p.m.
Dec. 25 Friday. . . . . . Christmas. University Buildings closed.

Easter Term

1926—Jan.	1	Friday......	New Year's Day. University Buildings closed.
Jan.	4	Monday.....	Mid-session examinations commence.
Jan.	6	Wednesday..	Last day for handing in IV Year Theses.
Jan.	7	Thursday....	Lectures and laboratory work commence at 9 a.m.
Jan.	8	Friday......	Meeting of Faculty Council. Meeting of Senate.
Jan.	13	Wednesday..	Meeting of Engineering Society.
Jan.	27	Wednesday..	Meeting of Engineering Society.
Feb.	5	Friday......	Meeting of Faculty Council.
Feb.	10	Wednesday..	Meeting of Engineering Society.
Feb.	12	Friday......	Meeting of Senate.
Feb.	24	Wednesday..	Meeting of Engineering Society.
Mar.	1	Monday.....	Last day for receiving applications for supplemental examinations.
Mar.	5	Friday......	Meeting of Faculty Council.
Mar.	10	Wednesday..	Meeting of Engineering Society. (Nomination Meeting).
Mar.	12	Friday......	Annual Elections Engineering Society. Meeting of Senate.
Mar.	24	Wednesday..	Annual General Meeting Engineering Society.
Apr.	1	Thursday....	Meeting of Faculty Council.
Apr.	2	Friday......	Good Friday. Neither lectures nor laboratory classes given.
Apr.	3	Saturday....	Easter Term ends. Lectures and laboratory work end at 12 m.
Apr.	6	Tuesday.....	Annual examinations commence.
Apr.	9	Friday......	Meeting of Senate.
May	7	Friday......	Meeting of Faculty Council.
May	14	Friday......	Meeting of Senate.
May	24	Monday.....	Victoria Day. University Buildings closed.
June	2	Wednesday..	Meeting of Senate.
June	4	Friday......	University Commencement.

UNIVERSITY OF TORONTO

ADMINISTRATIVE OFFICERS OF THE UNIVERSITY

THE UNIVERSITY

President...Sir Robert Alexander Falconer, K.C.M.G., D.Litt., Edin., LL.D., D.D., D.C.L., Oxon.
Registrar..............................James Brebner, B.A., LL.D.
Bursar........................Ferdinand Albert Mouré, Mus.Doc.
Librarian..........................William Stewart Wallace, M.A.
Director of Extension Work and Publicity..William James Dunlop, B.A.
Superintendent of Buildings and Grounds..Arthur D'Orr Le Pan, B.A.Sc.
Warden of Hart House..............John Burgon Bickersteth, M.A.
Director of University Health Service.......George Dana Porter, M.B.
Medical Adviser for Women Students...Miss Edith Gordon, B.A., M.B., D.P.H.
Manager of the University of Toronto Press....Richard J. Hamilton, B.A.

FACULTY OF APPLIED SCIENCE AND ENGINEERING

President.........................Sir Robert A. Falconer, K.C.M.G.
Dean of Faculty..Charles H. Mitchell, C.B., C.M.G., C.E., LL.D., D.Eng.
Secretary of Faculty....................S. G. Bennett, M.C., B.A.Sc.

E. A. Allcut, M.Sc. (Birmingham), M.I.Mech.E. — 50 St. George St.
Associate Professor of Mechanical Engineering.

G. R. Anderson, M.A. (Tor. & Harvard) — 7 Rose Park Cresc.
Professor of Engineering Physics and Photography.

R. W. Angus, B.A.Sc., M.A.S.M.E. — 42 Howland Ave.
Professor of Mechanicol Engineering.

E. G. R. Ardagh, B.A.Sc., F.C.I.C. — 148 Howard Park Ave.
Associate Professor of Chemical Engineering.

E. R. Arthur, B.Arch., M.A. (Liverpool), A.R.I.B.A. — 1053 Yonge St.
Assistant Professor of Architecture.

J. W. Bain, B.A.Sc., F.I.C. — 393 Brunswick Ave.
Professor of Chemical Engineering.

E. W. Banting, B.A.Sc. — 101 Farnham Ave.
Assistant Professor of Surveying.

M. C. BOSWELL, B.A.Sc., M.A. (Tor. & Harv.), Ph.D. — Mining Bldg.
Associate Professor of Organic Chemistry (in Chemical Engineering).

J. R. COCKBURN, M.C., B.A.Sc., M.E.I.C. — 100 Walmer Rd.
Associate Professor of Descriptive Geometry.

S. R. CRERAR, B.A.Sc., D.L.S. — 122 Grenadier Rd.
Assistant Professor of Surveying.

F. C. DYER, B.A.Sc., M.E.I.C. — 233 Ashworth Ave.
Assistant Professor of Mining Engineering.

O. W. ELLIS, M.Sc. (Birmingham), A.M.I.C.E. — 121 Howland Ave.
Assistant Professor of Metallurgical Engineering.

P. GILLESPIE, B.A.Sc., M.Sc. (McGill), C.E., M.E.I.C. — 358 Davenport Rd.
Professor of Civil Engineering.

G. A. GUESS, M.A. (Queen's) — Oakville, Ont.
Professor of Metallurgical Engineering.

H. E. T. HAULTAIN, C.E., M.E.I.C. — 156 Glencairn Ave.
Professor of Mining Engineering.

J. T. KING, B.A.Sc. — 126 Manor Rd.
Assistant Professor of Mining Engineering.

A. T. LAING, B.A.Sc. — 146 Balmoral Ave.
Associate Professor of Highway Engineering.

T. R. LOUDON, B.A.Sc., M.E.I.C. — 189 Sheldrake Blvd.
Associate Professor of Applied Mechanics.

H. H. MADILL, B.A.Sc., M.R.A.I.C. — 1595 Bathurst St.
Assistant Professor of Architecture.

J. H. PARKIN, B.A.Sc., M.E., F.R.Ae.S. — 10 Columbine Ave.
Assistant Professor of Mechanical Engineering.

H. W. PRICE, B.A.Sc. — 474 Palmerston Blvd.
Professor of Electrical Engineering.

T. R. ROSEBRUGH, M.A. — 92 Walmer Rd.
Professor of Electrical Engineering.

W. J. SMITHER, B.A.Sc., A.M.E.I.C. — Engineering Bldg.
Assistant Professor of Structural Engineering.

L. B. STEWART, D.T.S. — 17 Admiral Rd.
Professor of Surveying and Geodesy.

R. TAYLOR, B.A.Sc. — 107 Homewood Ave.
Assistant Professor of Mechanical Engineering.

W. M. TREADGOLD, B.A. — 13 Woodlawn Ave. E.
Associate Professor of Surveying.

C. H. C. WRIGHT, B.A.Sc., M.R.A.I.C. — 419 Markham St.
Professor of Architecture.

W. J. T. WRIGHT, M.B.E., B.A.Sc. — 126 Melrose Ave.
Assistant Professor of Engineering Drawing.

C. R. YOUNG, B.A.Sc., C.E., M.E.I.C. — 98 Hilton Ave.
Professor of Structural Engineering.

A. R. ZIMMER, B.A.Sc. — 80 Pine Crest Rd.
Assistant Professor of Electrical Engineering.

SESSIONAL APPOINTMENTS

S. G. BENNETT, M.C., B.A.Sc. — 121 Spadina Rd.
Lecturer in Commercial Engineering.

A. C. BLUE, B.A.Sc. — 487 St. Clarens Ave.
Demonstrator in Machine Design.

R. J. BROWN, B.A.Sc. — 380 Manning Ave.
Demonstrator in Electrical Engineering.

G. F. BRYANT, B.A.Sc. — Electrical Bldg.
Demonstrator in Electrical Engineering.

T. L. CAMPBELL, B.A.Sc. — 931 College St.
Demonstrator in Electrical Engineering.

K. L. CARRUTHERS, B.A.Sc. — 603 Huron St.
Demonstrator in Engineering Drawing.

A. R. CLUTE, B.A., LL.B. — 47 Elgin Ave.
Special Lecturer in Limited Companies and Common Law.

FREDERICK COATES, A.R.C.A. — Scarboro Bluffs P.O.
Instructor in Modelling.

W. R. COWAN, B.A.Sc. — 216 Cottingham St.
Demonstrator in Thermodynamics.

A. L. DAVIDSON, B.A.Sc. — 109 Balsam Ave.
Demonstrator in Chemical Engineering.

H. M. DILWORTH, B.A.Sc. — 259 Howland Ave.
Demonstrator in Chemical Engineering.

A. V. DELAPORTE, B.A.Sc. — 189 Robert St.
Instructor in Sanitary Chemistry.

W. B. DUNBAR, B.A.Sc. — 241 Glebeholme Blvd.
Instructor in Engineering Drawing.

W. C. C. DUNCAN, B.A.Sc. — 196 Ellsworth Ave.
Lecturer in Electrical Engineering.

H. B. DUNNINGTON-GRUBB, B.S.A. (Cornell) — 1158 Bay St.
Special Lecturer in Landscape Architecture.

G. F. EVANS, B.A.Sc. — Engineering Bldg.
Demonstrator in Machine Design.

M. G. EVANS, B.A.Sc. — 174 Howland Ave.
Demonstrator in Hydraulics.

W. S. FERGUSON — 52 Tranby Ave.
Special Lecturer in Accountancy and Business.

H. J. FRANKLIN, B.A.Sc. — 72 Delaware Ave.
Instructor in Engineering Drawing.

J. E. GOODWIN, B.A.Sc. — 22 Lytton Blvd.
Demonstrator in Electrical Engineering.

E. R. GRANGE, B.A.Sc. — 34 Chicora Ave.
Demonstrator in Engineering Drawing.

W. J. GRANT, B.A.Sc. — 83 Quebec Ave.
Demonstrator in Chemical Engineering.

W. H. GREAVES, M.A. (Bost.) — Victoria Coll.
Special Lecturer in Public Speaking.

W. S. GUEST, B.A.Sc. — 30 McMaster Ave.
Lecturer in Electrical Engineering.

U. C. HOLLAND, B.A.Sc.
Lecturer in Mechanical Engineering.

H. E. HOWDEN, B.A.Sc. — 275A Spadina Ave.
Demonstrator in Electrical Engineering.

F. W. HUGGINS, B.A.Sc. — 36 Garnock Ave.
Demonstrator in Mining Engineering.

C. A. HUGHES, M.M., M.A.Sc. — Mimico Beach, Ont.
Instructor in Applied Mechanics.

K. B. Jackson, B.A.Sc. — 242 Rusholme Rd.
Instructor in Engineering Physics and Photography.

C. W. JEFFERYS, M.O.S.A. — York Mills
Instructor in Freehand Drawing.

P. V. JERMYN, B.A.Sc. — 109 Collier St.
Demonstrator in Engineering Drawing.

R. E. LAIDLAW, B.A.Sc. — Belsize Court, Cor. Yonge and Belsize
Special Lecturer in Engineering Law.

J. S. E. MACALLISTER, B.A.Sc. — 22 Mountview Ave.
Demonstrator in Hydraulics.

G. G. MACDONALD, B.A.Sc. — Mining Bldg.
Temp. Demonstrator in Chemical Engineering.

R. J. MCGRATH, B.A.Sc. — 58 Triller Ave.
Demonstrator in Engineering Physics.

W. H. MACKLIN, B.A.Sc. — 530 Palmerston Blvd.
Demonstrator in Electrical Engineering.

A. S. MATHERS, B.A.Sc. — 34 Highview Cres.
Special Instructor in Architecture

R. H. MCCABE, B.A.Sc. — 30 Ross St.
Demonstrator in Electrical Engineering.

W. G. MCINTOSH, B.A.Sc. — 56 Prince Arthur Ave.
Lecturer in Machine Design.

J. G. MCNIVEN, M.A.Sc. — 300 Huron St.
Demonstrator in Mining Engineering.

J. W. MELSON, B.A.Sc. — 69 Walmsley Blvd.
Lecturer in Surveying.

M. V. POWELL, B.A.Sc. — Mechanical Bldg.
Temp. Instructor in Hydraulics.

J. W. REBBECK, B.Sc. (British Columbia), M.A. — 169 Avenue Rd.
Demonstrator in Chemical Engineering.

R. E. ROSSITER, B.A.Sc. — 126 Avenue Rd.
Demonstrator in Electrical Engineering.

C. C. ROUS, B.A.Sc. — 227 Cottingham St.
Instructor in Engineering Drawing.

W. L. SAGAR, B.A.Sc. *Instructor in Applied Mechanics.*	Apt. 1, 114 Carlton St.
H. L. SEYMOUR, B.A.Sc., C.E., A.M.E.I.C. *Special Lecturer in Town Planning.*	81 Victoria St.
J. E. B. SHORTT, B.A.Sc. *Demonstrator in Thermodynamics.*	401 Quebec Ave.
E. A. SMITH, M.A. *Lecturer in Chemical Engineering.*	113½ Soudan Ave.
E. W. SMITHSON, B.A.Sc. *Demonstrator in Electrical Engineering.*	58 Evans Ave.
J. J. SPENCE, B.A.Sc. *Demonstrator in Engineering Drawing.*	63 Stibbard Ave.
J. E. TOOMER, B.S. (N. Carolina State) *Lecturer in Metallurgical Engineering.*	328 Brunswick Ave.
H. A. TUTTLE, B.A.Sc. *Lecturer in Mechanical Engineering.*	492 Summerhill Ave.
A. C. WILSON, B.A.Sc. *Instructor in Engineering Drawing.*	283 Evelyn Ave.
W. S. WILSON, B.A.Sc. *Demonstrator in Engineering Drawing.*	20 Humewood Dr.
G. R. WORKMAN *Demonstrator in Engineering Drawing.*	22 Helena Ave.

MEMBERS OF OTHER FACULTIES GIVING INSTRUCTION TO STUDENTS IN APPLIED SCIENCE

S. Beatty, Ph.D., *Associate Professor of Mathematics.*	537 Markham St.
M. A. Buchanan, B.A., Ph.D., *Professor of Italian and Spanish.*	75 Heathdale Road
J. T. Burt-Gerrans, Phm.B., M.A., Ph.D. *Associate Professor of Electrochemistry.*	46 Dewson St.
J. H. Cameron, M.A., *Professor of French.*	96 Admiral Road
C. A. Chant, M.A., Ph.D., *Professor of Astro-Physics.*	201 Madison Ave.
A. T. DeLury, M.A., *Professor of Mathematics.*	74 St. Albans St.
B. Fairley, M.A., Ph.D., *Associate Professor of German.*	22 Kendal Ave.
J. H. Faull, B.A., Ph.D., *Professor of Botany.*	102 Yorkville Ave.
C. R. Fay, M.A., D.Sc., *Professor of History of Economics.*	88 St. George St.
J. G. Fitzgerald, M.D., *Professor of Hygiene and Preventive Medicine.*	186 Balmoral Ave.
D. T. Fraser, M.B., D.P.H., *Assistant Professor of Hygiene and Preventive Medicine.*	York Mills, Ont.
T. Hedman, Ph.B., *Assistant Professor of German.*	Old Forest Hill Road
F. B. Kenrick, M.A., Ph.D., *Professor of Chemistry.*	77 Lonsdale Road
W. J. Loudon, B.A., *Professor of Mechanics.*	Cooksville, Ont.
J. W. MacArthur, M.A., Ph.D., *Assistant Professor of Genetics.*	319 Roehampton Ave.
M. A. Mackenzie, M.A., *Professor of Mathematics.*	1 Bellwoods Park
A. MacLean, B.A., *Associate Professor of Geology.*	56 St. George St.
W. L. Miller, B.A., Ph.D., *Professor of Physical Chemistry.*	8 Hawthorne Ave.
E. S. Moore, M.A., Ph.D., *Professor of Economic Geology.*	53 Hewitt Ave.
G. H. Needler, B.A., Ph.D., *Professor of German.*	103 Bedford Road

W. A. Parks, B.A., Ph.D., *Professor of Geology.*	69 Albany Ave.
A. L. Parsons, B.A., *Associate Professor of Mineralogy.*	72 Isabella St.
L. J. Rogers, B.A.Sc., M.A., *Assistant Professor of Analytical Chemistry.*	29 Rosemount Ave.
H. B. Speakman, M.Sc., *Associate Professor of Zymology.*	61 Walmsley Blvd.
J. L. Synge, B.A., *Assistant Professor of Mathematics.*	183 Huron St.
J. E. Thomson, B.A.Sc., *Assistant Professor of Mineralogy.*	20 Chestnut Park Road
T. L. Walker, M.A., Ph.D., *Professor of Mineralogy.*	20 Avondale Ave.

SESSIONAL APPOINTMENTS

L. A. Bibet, *Instructor in French.*	47 Cecil St.
J. D. Garrard, M.A., *Assistant in Chemistry.*	Chemistry Bldg.
A. R. Gordon, M.A., *Assistant in Electrochemistry.*	40 Heath St. W.
H. W. Hilborn, B.A., *Lecturer in Italian and Spanish.*	58 Charles St. W.
G. E. Holt, M.A., Mus.Bac., *Lecturer in German.*	280 Bloor St. W.
H. R. Hugill, B.A., *Assistant in Electrochemistry.*	31 Highview Crescent.
I. W. Jones, B.A., B.Sc., *Class Assistant in Economic Geology.*	71 Charles St. W.
S. F. Kelly, B.Sc., *Class Assistant in Geology.*	8 Russell St.
D. E. Kerr-Lawson, B.A., *Demonstrator in Mineralogy.*	99 Bedford Rd.
O. C. H. Kitching, B.A., *Assistant in Chemistry.*	North House, Victoria Coll.
Miss J. C. Laing, B.A., *Instructor in French.*	39 MacFarland Ave.
R. R. McClenahan, B.A., M.B., D.P.H., *Demonstrator in Hygiene.*	54a Summerhill Gardens
R. B. Walker, B.A., *Assistant in Chemistry.*	65 Clinton St.

FACULTY OF APPLIED SCIENCE AND ENGINEERING

Historical Sketch

The Legislative Assembly of the Province of Ontario during the Session of 1877 gave its sanction to the establishment of a School of Practical Science on the basis proposed in the memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council on the 3rd day of February, 1877.

By the scheme thus approved the Government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the department of science, above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction of the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor on the 30th day of October, 1889.

By an Order-in-Council, approved by the Lieutenant-Governor on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School. By the terms of this order the management and discipline of the School was vested in the Council.

By the University Act of 1906 the School of Practical Science became the Faculty of Applied Science and Engineering of the University of Toronto, although on December 14th, 1900, the Senate by Statute, subsequently approved by the Lieutenant-Governor in Council, established a Faculty of Applied Science and Engineering but without assuming any liability for its support or maintenance. Under this Statute the teaching Staff and Examiners of the School of Practical Science became the teaching Staff and Examiners of the Faculty, although the University retained the right to appoint the Examiners for the Bachelor of Applied Science and professional degrees.

On April 8th, 1892, the Senate of the University established the Degree of B.A.Sc., which was open to those who held the Diploma of the School and were prepared to devote a fourth year to advanced work. In the Session 1909-1910 a new Course extending over four years and leading to the Degree of B.A.Sc. came into operation, taking the place of the long established Diploma Course of three years, which came to an end in the Session 1910-1911.

MATRICULATION

A candidate for admission to the First Year in the Faculty of Applied Science and Engineering must produce satisfactory certificates of good character and of having completed the seventeenth year of his age on or before the first of October of the year in which he proposes to register.

He must also present certificates giving him credit in the following subjects of Pass and Honour Matriculation:

PASS MATRICULATION

ENGLISH (Literature and Composition)
HISTORY (British and Ancient)
MATHEMATICS (Algebra and Geometry)
Any three of:
  LATIN (Authors and Composition)
  GREEK (Authors and Composition)
  FRENCH (Authors and Composition)
  GERMAN (Authors and Composition)
  SPANISH (Authors and Composition) *or*
  ITALIAN (Authors and Composition)
  EXPERIMENTAL SCIENCE (Physics and Chemistry) *or*
  AGRICULTURE (Parts I and II)

HONOUR MATRICULATION

(At least 50%)

ENGLISH (Literature and Composition).
MATHEMATICS (Algebra, Geometry and Trigonometry).
One of:
  LATIN (Authors and Composition).
  GREEK (Authors and Composition).
  FRENCH (Authors and Composition).
  GERMAN (Authors and Composition).
  SPANISH (Authors and Composition).
  ITALIAN (Authors and Composition).

In selecting the options it is recommended that students take French, German and Experimental Science. In the Department of Architecture, French is required, in the Departments of Chemical Engineering and Mechanical Engineering it is desirable that students take German. For students intending to take Metallurgical Engineering, Spanish and Experimental Science are recommended.

The regulations respecting Matriculation, together with a schedule of examinations which may be accepted as equivalent, may be found in the Curriculum for Matriculation on application to the Registrar of the University.

A candidate from the British Isles must present a certificate showing that he has passed or has exemption from the Preliminary Examination of the Institution of Civil Engineers.

ADMISSION

Applications for admission must be made on blank forms supplied by the Registrar, and should be forwarded as early as possible to the Registrar of the University, together with all Pass and Honour Matriculation or equivalent certificates.

Applications based upon certificates other than those mentioned will be considered as occasion may require. Such certificates must be accompanied by an official statement of the marks in the various subjects upon which the certificate was granted.

ADMISSION *AD EUNDEM STATUM*

An undergraduate of another University may be admitted *ad eundem statum* on such conditions as the Senate on the recommendation of the Council of the Faculty may prescribe.

An applicant for admission *ad eundem statum* must submit with his petition (1) a calendar of his University giving a full statement of the courses of instruction; (2) an official certificate of character and academic standing.

REGISTRATION

Students in any year will be required to register in person on the date specified in the Calendar for the registration of students in that year. Those who present themselves on subsequent days must petition the Council to be allowed to register. Council reserves the right to reject applications of, or impose penalties upon, those who fail to report on the dates specified.

ENQUIRIES

Enquiries with reference to requirements of admission to the Faculty of Applied Science and Engineering are to be addressed to the Registrar of the University.

Communications relating to curricula, instruction, examinations and standing therein, in the Faculty of Applied Science and Engineering are to be addressed to the Secretary of the Faculty.

DEGREES

Degree of Bachelor of Applied Science (B.A.Sc.)

Degree of Bachelor of Architecture (B.Arch.)

There are six graduating Departments leading to the Degree of Bachelor of Applied Science (B.A.Sc.) and one graduating Department leading to the Degree of Bachelor of Architecture (B.Arch.), viz.,

1. Civil Engineering.
2. Mining Engineering.
3. Mechanical Engineering.
4. Architecture.
5. (Discontinued.)
6. Chemical Engineering.
7. Electrical Engineering.
8. Metallurgical Engineering.

Descriptions of the courses in these Graduating Departments are given on pages 38, 39, 44, 47, 51, 54, 57, 60.

In the fourth year, optional courses are arranged in certain departments. Students are required to submit their selection to the Secretary in writing, not later than September 15th. The proposed selection must be approved by Council before adoption.

Degree of Master of Applied Science (M.A.Sc.)

Degree of Master of Architecture (M.Arch.)

Graduates holding the Degree of B.A.Sc. of this University or those holding the degree of another University recognized as equivalent, may take post-graduate work proceeding to the Degree of Master of Applied Science (M.A.Sc.). (For requirements, see page 106.)

Graduates holding the Degree of B.Arch. or B.A.Sc. in Architecture of this University, or those holding the Degree of another University recognized as equivalent, may take post-graduate work proceeding to the Degree of Master of Architecture (M.Arch.). (For requirements, see p. 106.)

Professional Degrees

Graduates in Applied Science and Engineering, and graduates of the School of Practical Science, may, after three years spent in professional work, present themselves for the degrees of Civil Engineer (C.E.), Mining. Engineer (M.E.), Mechanical Engineer (M.E.), Electrical Engineer (E.E.), Chemical Engineer (Chem. E.), Metallurgical Engineer (Met. E.), as the case may be, subject to the rules and regulations established by the University. (See page 107.)

FEES

All fees are payable at the Bursar's office between the hours 10 a.m. and 1 p.m. of each week day except Saturday (or may be remitted by mail).

The annual fees, including tuition, library, laboratory supplies and one annual examination for each year, shall be as follows:

If paid in full on or before November 5th	$150.00
If paid by instalments.—	
First instalment, if paid on or before November 5th	75.00
Second instalment, if paid on or before February 5th	78.00
Repeating the year—If paid in full on or before November 5th	75.00

The above fees are payable in advance. After November 5th a penalty of $1.00 per month will be imposed until the whole amount is paid. In the case of payment by instalments the same rule as to penalty will apply.

Students must have paid the fees due in the first term before proceeding to the work of the second term.

GENERAL FEES

Matriculation, or registration of Matriculation	$ 5.00
Supplemental examination	10.00
Admission *ad eundem statum*	10.00
Degree of B.A.Sc.	10.00
Degree of B. Arch	10.00
Degree of M.A.Sc.	25.00
Degree of M.Arch	25.00
Physical Training (see page 21)	5.00
Supplemental Physical Training (see page 21)	10.00
Hart House (see below)	8.00
Students' Administrative Council (see page 21)	3.00

DUES AND DEPOSITS

(Payable to the Secretary of the Faculty at the time of registration.)

Engineering Society membership	$2.00
Athletic Association membership	1.00
Annual deposit, Departments 1, 3, 4, 7	3.00
Departments 2, 6, 8	8.00

Charges for waste, neglect and breakage are to be met out of the deposit fee, the balance of which will be refunded to the student at the end of the session on application to the Secretary.

If the foregoing deposits do not cover the cost of breakage due to carelessness or neglect, the balance shall be paid by the student to the Secretary and in default of such payment the results of his examination will be withheld.

HART HOUSE FEE

Every male student in attendance, proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering, is required to pay to

the Bursar before December 1st the annual fee of eight dollars for the maintenance of Hart House. If this fee is not paid by the above date a penalty of two dollars will be imposed, making the total fee ten dollars.

STUDENTS' ADMINISTRATIVE COUNCIL FEE

Every student in attendance, proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering, is required to pay to the Bursar at the time of the entry of his name with the Secretary the annual fee of three dollars for the support of the Students' Administrative Council.

PHYSICAL TRAINING FEE

Every male student in attendance proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering is required to pay to the Bursar the annual Physical Training fee of $5.00 at the opening of each session in which Physical Training is compulsory for that student.

A student who has failed to complete satisfactorily the course in Physical Training prescribed for the First Year will not be permitted to register in the Third Year; and the student who has failed to complete satisfactorily the course in Physical Training prescribed for the Second Year will not be permitted to register in the Fourth Year.

Every student who has neglected to complete satisfactorily the course in Physical Training of the First or Second Year, and who must take this work during the Second or Third Year respectively of his course, will be required to pay to the Bursar at the opening of the session a Supplemental Fee of $10.00, in addition to the prescribed Physical Training fee.

SCHOLARSHIPS AND PRIZES

Through the generosity of friends of the University, encouragement has been given to both undergraduate and graduate work in the various branches, by establishing the following scholarships and prizes:

Name of Scholarship	Years Eligible	Amount	Described on page
Ontario Association of Architects...	I	$100	22
Harvey Aggett....................	II	$ 75	22
Boiler Inspection & Insurance Co....	III	$150	22
Jenkins Brothers, Limited..........	III	$100	22
Toronto Architectural Guild........	IV	....	22
C. J. Rhodes.....................	II, III, IV	£300	23
Khaki University & Y.M.C.A.......	II, III, IV	Loans	24
Jardine Memorial.................	All	$100	24
S. Ubakata.......................	All	....	25
U. of T. War Memorial............	All	$250	25
Æneas McCharles..................	All & Grad.	$1,000	25
1851 Exhibition..................	Graduate	£250	26
Nipissing Mining Co..............	Graduate	$1,100	28
A. R. Kaufman....................	Graduate	$600	28

ONTARIO ASSOCIATION OF ARCHITECTS' ARCHITECTURAL SCHOLARSHIP

The Ontario Association of Architects offers a scholarship in the Department of Architecture of the value of $100 to the student who has obtained the highest standard of general proficiency during the first year. This scholarship will be awarded annually in May, 1922 to 1926 inclusive.

HARVEY AGGETT MEMORIAL SCHOLARSHIP

This scholarship was donated by Mr. J. T. Aggett, of Toronto, as a perpetual memorial to his son, the late Lieutenant Harvey Aggett, who enlisted in March, 1915, during his second year in this Faculty, and was killed in action at Passchendaele on 6th November, 1917.

This annual scholarship of the value of seventy-five dollars is to be awarded to a student of the second year in this Faculty who, obtaining honours and being one of the first three in his year by his standing at the annual examinations relative to the pass requirements in his department, has been adjudged highest of the three in general student activities and service in the University during his period of attendance.

BOILER INSPECTION AND INSURANCE COMPANY SCHOLARSHIP

The Boiler Inspection and Insurance Company of Canada offers a Scholarship in the Department of Mechanical Engineering of the value of $150.00 to the student who obtains highest Honour Standing in the regular examinations of the third year.

The successful candidate will be expected to proceed to his fourth year during the session next following the date of the award.

The amount of the award will be credited by the Bursar to the fees of the fourth year of the successful candidate.

JENKINS SCHOLARSHIP IN ENGINEERING

The Jenkins Scholarship in Engineering, presented by Jenkins Bros., Limited, has been donated to continue for a period of five years, the first award to be made in 1925.

This annual scholarship, of the value of One Hundred Dollars, is to be awarded to the student of the third year registered in one of the six departments of Civil, Mining, Mechanical, Chemical, Electrical or Metallurgical Engineering, who has the highest aggregate of percentages for the first, second and third years, relative to the requirements of his department.

TORONTO ARCHITECTURAL GUILD MEDAL

The Toronto Architectural Guild was the organization of local architects from which sprung the Ontario Association of Architects. When the new and wider association became firmly established, the Guild disbanded and handed over to a trustee board certain funds for the establishment of a Medal to be awarded in the Department of Architecture of the University of Toronto.

The Trustee Board, now that the fund has accumulated considerably, announces its intention of awarding this medal annually to a senior student showing outstanding ability in Architectural Design.

THE RHODES SCHOLARSHIP

The trustees of the late Mr. C. J. Rhodes have assigned one of the Rhodes Scholarships to the Province of Ontario.

This scholarship will hereafter be thrown into open competition in the Province, subject to the following conditions:—

1. Candidates must be British subjects, with at least five years' domicile in Canada, and unmarried. They must have passed their nineteenth, but not have passed their twenty-fifth birthday, on October 1st of the year for which they are elected.

2. Candidates must be at least in their Sophomore Year at some recognized degree-granting University or College of Canada, and (if elected) complete the work of that year before coming into residence at Oxford.

3. Candidates may compete either in the Province in which they have acquired any considerable part of their educational qualification, or in the Province in which they have their ordinary private domicile, home or residence.

In each Province there is a Committee of Selection, appointed by the Trustees, in whose hands the nomination will rest. The Secretary of the Committee of Selection for Ontario is Norman S. Macdonnell, Esq., Barrister, Sun Life Building, Toronto.

The Committees of Selection are instructed to bear in mind the suggestions of Mr. Rhodes, who wished that, in the choice of his Scholars, regard should be had to

(*a*) Force of character, devotion to duty, courage, sympathy, capacity for leadership.

(*b*) Ability and scholastic attainments.

(*c*) Physical vigor, as shown by participation in games or in other ways.

Every candidate for a Scholarship is required to furnish to the Committee of Selection for his Province the following:—

(*a*) A certificate of age.

(*b*) A photograph preferably unmounted and not larger than 4×7 inches.

(*c*) A written statement from the President or Acting President of his College or University to the effect that his application as a suitable candidate is approved.

(*d*) Certified evidence as to the courses of study pursued by the Scholar at his University, and as to his gradings in those courses. This evidence should be signed by the Registrar, or other responsible official, of his University.

(*e*) A brief statement by himself of his athletic and general activities and interests at College, and of his proposed line of study at Oxford.

(*f*) Not more than four testimonials from persons well acquainted with him.

(g) References to four other responsible persons, whose addresses must be given in full, and of whom two at least must be professors under whom he has studied.

It is in the power of the Committee of Selection to summon to a personal interview such of the candidates as they find desirable to see, and, save under exceptional circumstances, no Scholar will be elected without such an interview. Where such an interview is dispensed with, a written statement of the reasons will be submitted to the Trustees.

The next appointment will be made for 1926; applications for this Scholarship with all required material must reach the Secretary of the Committee of Selection not later than October 20th, 1925.

The Scholarship is of the value of £300 a year, and is tenable for three years, subject to the continued approval of the College at Oxford of which the Scholar is a member. In addition a scholar will receive, until further notice, an annual bonus of £50.

Rhodes Scholar, graduate of this Faculty:—

W. J. Browne, B.A.Sc., 1919.

The Khaki University and Y.M.C.A. Memorial Scholarship Fund

The Khaki University and Y.M.C.A. Memorial Scholarship Fund was established by the Khaki University Committee. At the present time this fund is being used to make loans to returned-soldier students of the higher years. Applications for such loans should be made to the President of the University.

The Jardine Memorial Prize for English Verse

1. This prize, of the value of $100, shall be open to any regular undergraduate student who has been in actual attendance at the University during the academic year preceding the date of submission (November 1) or who graduated in the previous academic year.

2. The subject and metre of the poem shall be left to the choice of the competitor.

3. It is suggested that the length of the poem should be not less than 100 or more than 300 lines.

4. The poems shall be in the hands of the Registrar of the University by November 1st.

5. Each poem shall be signed with a pseudonym and the competitor's name shall be submitted to the Registrar in a sealed envelope on which the pseudonym shall be written.

6. With his or her name the competitor shall enclose a signed statement that the poem is absolutely his or her original work.

7. The competition shall be judged by a board of five examiners, consisting of the head of the Department of English in each of the four colleges, and of a fifth examiner to be chosen by these four.

8. The examiners shall have the power to withhold the award in any year if no poem which has been submitted for that year be found worthy of the prize.

THE UBUKATA FUND

The S. Ubukata Fund of $10,000, the gift of Mr. S. Ubukata, provides for the establishment of prizes, medals, scholarships and loans for which Japanese students of all faculties and colleges may be eligible. Information regarding the conditions of award may be obtained from the Registrar of the University.

THE UNIVERSITY OF TORONTO WAR MEMORIAL SCHOLARSHIPS

Three Scholarships, each of the value of two hundred and fifty dollars have been established by the Alumni Federation of the University from the War Memorial Fund to be awarded to students in the Faculty of Applied Science and Engineering.

The general basis on which the above scholarships may be awarded is as follows:

(*a*) Candidates must have served, or must be near relatives of persons who served, in His Majesty's or Allied Forces during the Great War, 1914-1918.
(*b*) Standing in course of studies.
(*c*) Need of assistance.
(*d*) Such other general qualifications of merit as may commend themselves to the Committee.

Information regarding these scholarships may be obtained from the Secretary-Treasurer of the Alumni Federation, Room 225, Simcoe Hall, to whom applications for the same must be made.

THE MCCHARLES PRIZE

This prize was established in connection with the bequest of the late Æneas McCharles of Provincial Government bonds of the value of $10,000, and is awarded on the following terms and conditions, namely, that the interest therefrom shall be given from time to time, but not necessarily every year, like the Nobel prizes in a small way: (1) To any Canadian from one end of the country to the other, and whether student or not, who invents or discovers any new and improved process for the treatment of Canadian ores or minerals of any kind, after such process has been proved to be of special merit on a practical scale; (2) Or for any important discovery, invention or device by any Canadian that will lessen the dangers and loss of life in connection with the use of electricity in supplying power and light; (3) Or for any marked public distinction achieved by any Canadian in scientific research in any useful practical line. The following conditions, as passed by the Board of Governors, determine the method of award:—

(1) The title shall be the McCharles Prize.

(2) The value of the prize shall be One Thousand Dollars ($1,000.00) in money.

(3) The term "Canadian" for the purpose of this award shall mean any person Canadian born who has not renounced British alliance; and for the purpose of the award in the first of the three cases provided for by the bequest, domicile in Canada shall be an essential condition.

(4) Every candidate for the prize shall be proposed as such in writing by some duly qualified person. A direct application for a prize shall not be considered.

(5) No prize shall be awarded to any discovery or invention unless the same shall have been proved to the satisfaction of the awarding body, to possess the special practical merit indicated by the terms of the bequest.

(6) The order of priority in which the three cases stand in the wording of the bequest shall be observed in making the award; that is, the award shall go *caeteris paribus* to the inventor of methods of smelting Canadian ores; and, failing such inventions, to the inventor of methods for lessening the dangers attendant upon the use of electricity; and only in the third event, if no inventors of sufficient merit in the field of metallurgy and electricity present themselves, to the inventor distinguished in the general field of useful scientific research.

(7) The first award was made in 1910.

(8) The composition of the awarding body shall be as follows:—

An expert in Mineralogy,
An expert in Electricity,
An expert in Physics,

and four other persons. All of the members of this body shall be nominated by the Board of Governors of the University of Toronto.

THE 1851 EXHIBITION SCIENCE RESEARCH SCHOLARSHIP

The Royal Commissioners for the Exhibition of 1851, if satisfied with the qualifications of the candidates put forward, will each year allot three Science Research Scholarships to Canada. The University of Toronto has been invited to recommend annually one or more candidates in order of merit for these Scholarships.

1. Each candidate recommended must be a British subject and under twenty-six years of age, except under very special circumstances; he must be a bona fide student of Science of not less than three years' standing; he must also have completed a full University course and have spent at least one full academic year at this University prior to the date of recommendation.

2. The record of a candidate's work must indicate high promise of capacity for advancing science or its applications by original research. Evidence of this capacity, which is the main qualification for the Scholar-

ship, is strictly required. The most suitable evidence is a satisfactory account by the candidate of research work already performed, and the Commissioners will decline to consider the claims of a candidate unless such an account is furnished, or unless there is other equally distinct evidence that he possesses this qualification.

3. Applications for these Scholarships must be made to the Registrar of the University not later than April 15th; the latest date on which the recommendation of the University of Toronto for Scholarships offered in 1926 can be received at the Office of the Commissioners is June 1st, 1926.

4. Each Scholarship is of the value of £250 per annum, payable quarterly in advance; on presenting to the Commissioners a satisfactory final report at the expiration of his Scholarship the scholar will receive a grant of £25. A scholar who is not in a position to travel at his own expense, or for whom it is not possible to obtain free passage, may make application to the Commissioners for aid towards the payment of his fare from his home to his place of study. A Scholar will receive an additional annual allowance, not exceeding £30, towards the cost of University fees, if, in the opinion of the Commissioners, he is in need of such allowance.

5. The Scholarship will be tenable ordinarily for two years, and in cases of exceptional merit for three years. The continuation of a Scholarship for a second year will depend upon the satisfactory nature of the scholar's first year's work. Renewal for a third year will be granted only where it appears that the renewal is likely to result in work of scientific importance.

6. The scholar will be required to devote himself to research in some branch of pure or applied science, the particular nature of the work proposed to be approved by the Commissioners.

7. A scholarship may be held, with the approval of the Commissioners, at any Institution in the United Kingdom or abroad, but a scholar will not be permitted, except under very special circumstances, to conduct his investigations in the country in which he has received his scientific education.

8. Scholars will be required to furnish reports of their work at the end of each year of tenure of their scholarships.

9. Scholars will be required to devote their whole time to the objects of the scholarship, and will be forbidden to hold any position of emolument which carries with it a duty inconsistent with their obligation to the Commissioners. Scholars must in any case obtain the consent of the Commissioners before accepting any additional emoluments.

10. In case of misconduct on the part of a scholar the Commissioners may, at their absolute discretion, deprive him of his scholarship and all emoluments therefrom.

The regulations adopted by the Senate are as follows:—

The departments, students of which shall be eligible to be candidates, are:—1. Bacteriology; 2. Biochemistry; 3. Botany; 4. Chemistry; 5. Engineering (chemical); 6. Engineering (civil); 7. Engineering (electrical); 8. Engineering (mechanical); 9. Engineering (metallurgical); 10. Engineering (mining); 11. Forestry; 12. Geology; 13. Mineralogy; 14. Physics; 15. Physiology; 16. Zoology.

A student shall not be deemed to be ineligible because of his being on the teaching staff of the University, if he has not been in receipt of a salary of more than $800 per annum and has not been on the teaching staff for more than two years from graduation.

A student shall be deemed to be eligible in the year in which he intends to graduate, but if nominated for the Scholarship his nomination shall be subject to his being successful in passing his examination for his degree.

The nomination of the candidate or candidates shall be made by a Board composed of seven members appointed by the Senate, and the Board shall consist of the Chancellor, the President, the Reverend Dr. Bowles, the Honourable Mr. Justice Masten, the Honourable W. E. Raney, Dr. J. A. Worrell and Dr. C. Morse, and the Board shall have power to call to its aid as assessor any member of the teaching staff.

THE NIPISSING MINING COMPANY RESEARCH FELLOWSHIP

The Nipissing Mining Company has endowed a Research Fellowship in the Department of Mining Engineering to be known as The Nipissing Mining Company Research Fellowship, of the annual value of eleven hundred dollars ($1,100.00).

This Fellowship is open to the graduates of any University.

KAUFMAN FELLOWSHIP IN TOWN PLANNING

Mr. A. R. Kaufman presented a fellowship of $600 for research work on Town Planning in the Departments of Architecture and Civil Engineering: Municipal and Structural, for the Session 1924-25.

JUNIOR INSTRUCTORSHIPS

Provision is made for the sessional appointment in various departments of graduates as Fellows or Demonstrators, whose duties shall consist of aiding in the work of instruction under the direction of the department concerned.

Applications for appointment should be made in writing to the Secretary of the Faculty not later than September 1st.

RESEARCH ASSISTANTSHIPS

A number of research assistants in the School of Engineering Research are appointed annually on salary, in the various departments, to carry on the work of research under the direction of members of the staff. This

work is accepted as partial fulfilment of the requirements for the degrees of M.A.Sc. and M.Arch. These research assistants are usually recent graduates and are chosen from among those who have displayed special capacity for investigational work in their undergraduate courses. Prospective applicants should consult with members of the staff as soon as possible after the annual examination.

REGULATIONS RESPECTING EXAMINATIONS

Regular Examinations

Promotions from one year to another are made on the results of the term work and the annual examinations. A Student proceeding to a degree must pass all the term work and the examinations in the subjects of his course and at the periods arranged from time to time by the Council.

Candidates who fail to pass in any year will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they fail before presenting themselves a second time for examination. (This repetition includes vacation work.)

A student who in either term of the session fails to perform the work of his course in a manner satisfactory to the professors in charge, will not be allowed to present himself at the final examinations of the year.

In the second, third and fourth years annual examinations will be held at the beginning of the second term on all subjects completed during the first term.

No student will be allowed to write at any examination who has not paid all fees and dues for which he is liable at that time.

The pass marks required on written examinations is 40% and on practical examinations 60%.

Honours will be granted in each department to the students who obtain at least 50 per cent. in each subject, and 75 per cent. of the total number of marks allotted to the department at the annual examinations.

Honour Graduate standing will be granted to those who obtain honours in the final and in one previous year.

Term Examinations

Term examinations may be held in any subject and at any time at the discretion of the instructor or by order of the Council, and the results of such examination may, if the Council so decides, be incorporated with those of the annual examinations in the same subjects.

Supplemental Examinations

A candidate who fails in one or two subjects at the Annual Examinations will be required to take supplemental examinations in such subjects, but no student will be allowed a supplemental examination in the laboratory work of the fourth year

The supplemental written examinations will begin on the 22nd day of September, 1925. Notice in writing of his intention of taking such examinations (including practical ones) must be received from the candidate by the Secretary of the Faculty, and the fee of $10.00 received by the Bursar, not later than the first of September. Council reserves the right to reject applications of, or impose penalties upon, those failing to comply with these requirements. Arrangements will be made to conduct supplemental examinations at the Survey Camp for those students in attendance.

In the case where a candidate desires to write upon an annual examination as a supplemental, his application must be received by the Secretary, and his fee by the Bursar, for the January examinations not later than the first of December and for the April examinations not later than the first of March.

Where a candidate fails to pass a supplemental examination it will be counted as one of the two supplemental examinations which may be allowed him after the next annual examination.

No student will be permitted to take the work required for a laboratory supplemental examination at any time other than the regular time of the session.

VACATION NOTES

All Departments

Vacation notes must be handed to the Department of Engineering Drawing on or before the first day of the session.

Vacation notes must be on construction only, and contain not less than twenty, nor more than thirty pages of sketches (except in the Department of Architecture). These sketches must be freehand pencil drawings with figured dimensions.

Notes must be made in standard note books approved by the Faculty. Notes which have been taken during the session in connection with the work in drawing will not count as vacation work.

The minimum percentage of marks required for practical work must be made in the case of vacation notes. (See page 104.)

VACATION LETTERS

Department of Mining Engineering

THIRD YEAR STUDENTS:—Four letters to be written and mailed to the Professor of Mining Engineering, one each month, June, July, August and September; at least one letter must deal with a labour episode.

FOURTH YEAR STUDENTS:—The student may select either one of the following alternatives:—

A. Four letters to be written and mailed, one each month, June, July, August and September; at least one letter to be on a labour episode: or

B. One letter describing a labour episode to be written and mailed to the Professor of Mining Engineering not later than June 30th, and an article of suitable character and length for submitting to the Engineering Institute of Canada or the Canadian Mining Institute as a student's paper, to be written and mailed to the Professor of Mining Engineering not later than September 30th. (See page 73).

FIELD EXPERIENCE

Department of Mining Engineering

The following are the regulations governing field experience certificates:

A candidate for the degree in the Department of Mining Engineering will be required to present satisfactory evidence of having had at least six months' practical experience in work connected with mining, metallurgy or geology, for which he must have received regular wages.

The time may be spent on geological survey, in ore dressing, smelter or lixiviation works, in an assay office in the vicinity of mining or metallurgical works, on any work in or about a mine other than as an office man or clerk, or in prospecting. Not more than three months on geological surveys will be accepted, and prospecting will only count one-half (*i.e.*, four months' prospecting will be counted as two months) and must not be submitted for more than three of the six months.

Certificates must be made out, signed, countersigned and sent during the first term to the Secretary of the Faculty of Applied Science and Engineering, who will retain them.

SHOP WORK

Departments of Mechanical and Electrical Engineering

Students in Mechanical and in Electrical Engineering are not granted their degree until certificates have been submitted to the Council, and accepted as satisfactory, showing not less than 1,600 hours of mechanical experience in production under commercial conditions. Preferably the work undertaken should be in one of the manufacturing industries or trades with which the course is related. Certificates, on the standard form which may be procured from the Secretary, must be presented on or before the 1st of March of any year.

It is not desirable that a student in these courses should enter the engineering industries without having acquired some experience in mechanical production and it is therefore required that he obtain this experience under commercial conditions, so that he can appreciate shop conditions and limitations.

REGULATIONS RESPECTING TERM WORK

Students working in any laboratory must be governed by the regulations relating thereto as made known from time to time.

No laboratory reports or drawings may be removed from the laboratories without permission. The Council reserves the right to dispose of them as may be thought proper.

FIELD WORK

Field Work in Surveying of the First and Second Years will be taken on the University grounds, during the first term.

No field notes will be counted which have not been taken in the field and during the hours allotted to such work.

Students taking practical astronomy are required to take observations in the field for time, latitude and azimuth.

DEPARTMENTAL EXCURSIONS TO POINTS OF INTEREST

As a part of Laboratory Instruction excursions to points of technical interest, both in Toronto and elsewhere, are arranged by the staff. These excursions are treated as laboratory periods with the same requirements as to attendance and reports. The total transportation costs in any one year will probably not exceed Ten Dollars.

SUMMER SURVEY SESSION

Practical surveying of the Third Year will be taken previous to the opening of the fall term during the months of August and September at the University Survey Camp situated on the shore of Gull Lake, and about five miles from the Village of Minden (lot No. 9 in 13th Concession of the Township of Lutterworth). The camp may be reached by taking the train leaving Lindsay for Haliburton, and getting off at Gelert. Conveyances will be on hand to meet students and take them to the camp. Personal effects must be limited to sixty pounds in weight, which must include two pairs of blankets, or their equivalent; beds and mattresses only will be provided.

A field course in Geology will be given students in Department 2 the last week of the session at the camp.

Students will report at the camp on the dates shown on page 7.

Students of the Fourth Year in Department 1 who are taking the Astronomy Option are required to spend two weeks at the camp, beginning September 8th, after completing their Third Year.

DRAFTING ROOMS

No drawings or briefs for same will be counted which have not been made in the drafting rooms, and during the hours allotted to such work.

Theses

In the Fourth Year each student is required to prepare a thesis on a subject approved by the Council. The title of the thesis must be sent to the Secretary of the Faculty for approval on or before November 1st, and the completed thesis must be handed in on or before January 6th and shall become the property of the University. The rules governing size, form, etc., may be obtained on application to the Secretary. (See also p. 104.)

The thesis of each student who works upon a research problem in his fourth year must deal with the subject of investigation. In such cases the theses must be handed in not later than one week prior to the close of the annual examinations.

REGULATIONS RESPECTING STUDENTS IN ATTENDANCE

All interference on the part of any student with the personal liberty of another by arresting him, or summoning him to appear before any unauthorized tribunal of students, or otherwise subjecting him to any indignity or personal violence, is forbidden by the Caput.

A student who is under suspension, or who has been expelled from a College or from the University, will not be admitted to the University buildings or grounds.

The name of the University is not to be used in connection with a publication of any kind without the permission of the Caput.

No student will be enrolled in any year, or be allowed to continue in attendance, whose presence is deemed by the Council to be prejudicial to the interests of the University.

Students proceeding regularly to the degree are required to attend the courses of instruction and the examinations in all subjects prescribed for students of their respective standing, and no student will be permitted to remain in the University who persistently neglects academic work.

Unless special permission is granted by the Council, a student who, at the close of two sessions in the University, has failed to secure standing in his year, will not be permitted registration in the Faculty of Applied Science and Engineering.

The constitution of every University society or association of students in the Faculty of Applied Science and Engineering and all amendments to any such constitution must be submitted for approval to the Council of the Faculty. All programmes of such societies or associations must, before publication, receive the sanction of the Council of the Faculty through the Dean. Permission to invite any person not a member of the Staff of the University to preside at or address a meeting of any society or association must be similarly obtained.

EXEMPTIONS

Applications for exemption from any of the regulations shall be made to the Council in writing and the particulars of the case fully stated.

A student shall submit to Council evidence of illness or other handicap which occurs during the session immediately after its occurrence: no petition for leniency on account of such incidents will be considered if received after the third day following the last day of examinations.

GENERAL INFORMATION FOR STUDENTS

The Council of University College and the governing bodies of the federated universities and colleges, respectively, have disciplinary jurisdiction over and entire responsibility for the conduct of their students in respect of all matters arising or occurring in or upon their respective college buildings and grounds, including residences.

The councils of such of the faculties as have assigned for their separate use any building or buildings and grounds, including residences, have disciplinary jurisdiction over and entire responsibility for the conduct of all students in their respective faculties in respect of all matters arising or occurring in or upon such building, or buildings and grounds.

In all such cases, and, save as aforesaid, as respects all students to whatso ever college or faculty they may belong, disciplinary jurisdiction is vested in the Caput, but the Caput may delegate its authority in any particular case or by any general regulation to the council or other governing body of the university or college or faculty to which the student belongs.

The Caput has also power and authority to determine by general regulations, or otherwise, to what college, faculty or other body the control of university associations belongs.

If there be any questions as to the proper body to exercise jurisdiction in any matter of discipline which may arise, the same shall be determined by the Caput, whose decision shall be final.

Disciplinary jurisdiction includes the power to impose fines.

Information as to the text-books, instruments and materials to be purchased by the students will be given on registration at the beginning of the session.

HART HOUSE

Hart House, the gift of the Massey Foundation, is so called in memory of Mr. Hart Massey. In its widest interpretation it seeks to provide for all the activities in the undergraduate's life apart from the actual work in the lecture room. It affords all the facilities of a first-rate club. In the beauty of its architecture and the various functions which it performs it is unique on this continent.

Hart House contains completely equipped club rooms, including common rooms, reading room, music room, lecture room, sketch room, photographic dark rooms, the Great Hall, which is the students' dining hall, a small Chapel, rooms reserved for religious organizations in the University, gymnasia, squash courts, swimming pool, running track, rifle range, billiard room, library and Hart House Theatre.

Hart House is open from 8.00 a.m. to 11.15 p.m. daily and meals are served in the Great Hall throughout the academic year. Members are entitled to full privileges of all rooms in the building between these hours and the use of the gymnasia, pool, showers and locker rooms until 6.30 p.m. each day, except Sunday, subject to the regulations of the Athletic Association.

The Library contains a good selection of books of general interest. These books must not be taken from the room.

Sunday Evening Concerts are given by the leading musicians of the city at 9 p.m. in the Great Hall on certain Sundays during the session and and music recitals take place at 5 p.m. every Friday in the Music Room.

The Sketch Room is equipped with facilities for drawing and painting. Weekly drawing and painting classes are given by a qualified instructor and frequent exhibitions of pictures and lectures on Art are arranged.

A group of rooms is set apart for the use of the Faculty Union. A dining room and a common room are also reserved for Graduate Members. Six bed-rooms are available for the use of guests at a reasonable charge.

The Warden is entrusted with the general supervision of the whole house in co-operation with the following committees: House, Hall, Library, Music, Billiard, Sketch, Camera and Squash. These committees consist of two senior members, a graduate member, the Warden and a full representation of undergraduates. The undergraduates are elected annually by their fellow students. The Board of Stewards is the Senior Committee and has final control of the House, being directly responsible to the Board of Governors. It consists of the Warden (*ex officio* chairman) and representatives of the President of the University, the Board of Governors, the Faculty Union, the Athletic Association, the Graduate Members, the Student Christian Association, the Students' Administrative Council and the undergraduate secretaries of all Standing Committees.

Hart House Theatre is an Art Theatre in the University, existing to promote the interests of dramatic art in the widest sense. The theatre is operated by a Board of Syndics, who are responsible to the Governors of the University for its administration. It has always been the policy of the Syndics to encourage the use of the theatre by those recognized dramatic societies within the University which are endeavouring to do

serious work. When it is possible to do so, without interfering with the legitimate activities of the Theatre, the Syndics will be glad to allow its use by other student organizations.

All male undergraduates proceeding to a degree in the University are members of Hart House. The annual fee of $8.00 covers all fees in connection with Hart House and membership in the Athletic Association for the academic year (September to May). Membership Cards may be obtained at the Warden's Office on presentation of the Bursar's receipt for fees paid.

Hart House has no endowment whatsoever and is entirely dependent for its upkeep on the fees received from graduates and undergraduates and from various sources of revenue in the House itself.

Other male students in the University, or students in the affiliated or federated institutions receiving instruction in the University, may become members of Hart House on payment of the required fee at the Warden's office. Should the students of any of these institutions elect to join Hart House in a body the $8.00 fee still obtains but for individual membership the fee is $10.00.

Graduates are entitled to the full privileges of Hart House on payment of an annual fee of $10.00. Out-of-town graduates may become members on payment of an annual fee of $2.50.

STUDENTS' ADMINISTRATIVE COUNCIL

The Students' Administrative Council has been entrusted by the Caput with supervision of the conduct of the students, and has power subject to the approval of the Caput to deal with violations of the regulations governing conduct.

Any student who may be convicted of having taken part in a parade or procession through the city which has not been authorized by the police authorities after application by the Executive of the Students' Administrative Council, will be severely disciplined.

UNIVERSITY OF TORONTO ATHLETIC ASSOCIATION

University Athletics are under the entire control of the University of Toronto Athletic Association, the Executive body being the Athletic Directorate. This consists of:

- The President of the University,
- Two members of the Faculty, appointed by the President,
- Two Graduates, appointed by the Athletic Advisory Board,
- The Medical Director and the Financial Secretary (*ex officio*),
- Five Undergraduates, elected annually,
- An Undergraduate representative, appointed by the Executive of the Students' Administrative Council.

The Directorate alone has the power to sanction the use of the name "The University of Toronto" in connection with athletics, and no athletic event can be held in the University without its approval. It has control of the Athletic Field, the Gymnasium, the Swimming Pool, and other conveniences in connection with Athletics in Hart House, and is empowered by the Board of Governors to make the necessary arrangements to effect the carrying out of the University regulations requiring Physical Training.

THE GRADUATING DEPARTMENTS

The instruction in the various departments leading through the four years to the degrees of B.A.Sc. and B.Arch. is designed to give the student a thorough grounding in the fundamentals of the engineering and architectural professions, and in addition a sufficient familiarity with applications of the principles to make him immediately useful upon graduation.

With the exception of Architecture and Chemical Engineering the various courses are very similar in the first year. The succeeding years are devoted to the more particular work of the departments. In the fourth year specialization develops to the extent of various options.

The graduating courses are so designed, with many subjects common to the departments of the several years, that the student upon graduation will find himself sufficiently equipped in the various fundamentals to pursue readily his studies in branches other than the one in which he has graduated and indeed to be useful in them as well. The courses in this Faculty are not planned to make specialists; the process of specialization is more properly deferred until after graduation.

In the teaching of the fundamentals, instruction is not confined wholly to applied science. As the future engineer is vitally concerned with the development of the country, it is essential that he be instructed as well in certain fundamentals in economics, administration and business which, in conjunction with his scientific training, will enable him to develop his full value.

In some departments laboratory work in the fourth year consists of an investigation of some specific problem. In all cases the student's knowledge of the original literature and primary sources of information is extended, and he is given a very desirable and useful training in methods of research. In this way the undergraduate course is linked with the graduate course (see p. 106) and with the work of the School of Engineering Research (see p. 105).

On the following pages the courses of instruction in the different departments are set forth in detail. The time devoted to lectures and practical work is indicated as accurately as possible, but is subject to modification from time to time as occasion may require.

For further information concerning the opportunities available for graduates of this Faculty, reference should be made to the pamphlet issued by the Director of Extension Work and Publicity of the University entitled "Opportunities for Graduates in Applied Science."

1. DEPARTMENT OF CIVIL ENGINEERING

The course in Civil Engineering is designed to meet the needs of the students who intend to take up such work as Geodetic Surveying, Railway Engineering, Municipal Engineering, Sanitary Engineering, Highway Engineering, Structural Engineering, Hydraulic Engineering, and administrative work in connection with both Engineering and Industrial undertakings.

FIRST YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	5	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Optics	185	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	2

SECOND YEAR

Subject	No.	Hours per week			
		First Team		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	286	...	..	..	..
Calculus	237	1	0	1	0
Spherical Trigonometry	239	1	0	0	0
Elementary Astronomy	71	1	0	1	0
Descriptive Geometry	162	1	0	1	0
Surveying	272, 273	1	9	1	0
Dynamics	3	1	0	1	0

CIVIL ENGINEERING—SECOND YEAR—Cont.

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Mechanics of Materials	4	2	0	2	0
Engineering Chemistry	93	1	0	0	0
Inorganic Chemistry	87A	1	0	0	0
Organic Chemistry	95	0	0	1	0
Metallurgy	241	0	0	1	0
Geology	195	0	0	2	0
Mineralogy	257,259	2	1	0	2
Hydrostatics	186	0	0	1	1
Heat	187	1	1½	0	0
Photography	188	1	1½	0	1½
Economics & Finance	123	1	0	1	0
Chemical Laboratory	89	0	3	0	3
Engineering Drawing	169	0	4½	0	13½
Physical Training	269	0	2	...	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Survey Camp	275	...	...	...	...
Engineering Chemistry	102	1	0	1	0
Theory of Structures	6	2	0	2	0
Thermodynamics	223, 224	1	0	1	2
Hydraulics	205, 206	2	0	2	3
Least Squares	240	0	0	1	0
Practical Astronomy and Geodesy	72, 73	2	2	2	0
Descriptive Geometry	164	1	0	0	0
Surveying and Levelling	274	1	0	1	0
Electricity	143, 144(*a*)	1	3	1	0
Stress Graphics	10	1	0	1	0
Cements and Concrete	11	0	0	1	0
Engineering Geology	197	1	0	1	0
Commercial Law	124	1	0	1	0
Public Speaking	133	1	0	0	0
Mechanics of Materials Laboratory	9	0	3	0	0
Engineering Drawing	173	0	12	0	15

CIVIL ENGINEERING—FOURTH YEAR

(a) Astronomy Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Survey Camp	275	..	..	..	..
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Astronomy	74, 76	2	23	2	0
Geodesy	75, 76	2	0	2	23
Photographic Surveying	191	1	2	0	0

FOURTH YEAR

(b) Municipal Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Hydraulics	211	1	3	0	0
Structural Design	17	1	0	0	0
Structural Design Drawing	179	0	0	0	5
Miscellaneous Structures	19	0	0	1	0
Hygiene and Bacteriology	82	1	0	1	6
Biology	81	0	5	0	0
Sanitary Chemistry	117	1	6	0	4
Sanitary Engineering	280	1	3	1	6
Highway Engineering	281	1	3	1	3
Municipal Seminar (including Town Planning)	282	0	3	0	3
Municipal Administration (including Civics)	132	1	0	1	0

CIVIL ENGINEERING—FOURTH YEAR—(c) Structural Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Physical Metallurgy	252	1	0	1	0
Structural Design	17, 18	2	0	1	0
Miscellaneous Structures	19	0	0	1	0
Mechanics of Materials Laboratory	13	0	3	0	6
Structural Design Drawing	178	0	22	0	22

FOURTH YEAR—(d) Hydraulic Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Hydraulics	207, 208, 209	3	10	3	10
Physical Metallurgy	252	1	0	1	0
Structural Design	17, 18	2	0	1	0
Miscellaneous Structures	19	0	0	1	0
Electrical Laboratory	144 (*a*)	0	0	0	3
Mechanics of Materials Laboratory	13	0	6	0	3
Structural Design Drawing	179	0	4	0	8

CIVIL ENGINEERING—FOURTH YEAR

(e) Railway Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Hydraulics	211	1	3	0	0
Special Geology	204	0	0	1	1½*
Physical Metallurgy	252	1	0	1	0
Electrical Laboratory	144 *(a)*	0	0	0	3
Motive Power	225	1	0	1	0
Railway and Miscellaneous Structures	20, 19	1	0	1	0
Railway Economics	131	2	0	2	0
Railway Location and Design	276	1	8	1	6
Mechanics of Materials Laboratory	13	0	3	0	6
Structural Design Drawing	179	0	6	0	6

*The ½ hour represents two excursions during the term.

2. DEPARTMENT OF MINING ENGINEERING

The course in Mining Engineering, which originated in 1878 as a course in Assaying and Mining Geology, is intended to serve as a preliminary training for those who expect to practice in some branch of Mining Engineering, such as exploration of mining areas and primary development, mine surveying, mining processes involving civil, mechanical, and electric work of underground workings, mining machinery and operation; milling and treatment of ores, assaying and other forms of analysis and research, and administrative work in connection with both Engineering and Industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	5	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Mineralogy	255, 258	2	1	0	3
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Mining Laboratory	50	0	0	0	3
Engineering Drawing	166	0	11	0	14
Physical Training	269	0	2	0	2

Mining Engineering—Second Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Notes	286	..	..	..	..
Descriptive Geometry	162	1	0	1	0
Surveying	272, 273	1	6	1	0
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Inorganic Chemistry	87A	1	0	0	0
Inorganic Chemistry	87B	0	0	1	0
Organic Chemistry	95	0	0	1	0
Metallurgy	241	0	0	1	0
Geology	195	0	0	2	0
Mineralogy	260, 261	1	2	1	2
Mining	51, 53	1	3	0	0
Theory of Measurements	65	1	0	0	0
Steam Engines	216	0	0	1	0
Theory of Mechanism	230	2	0	2	0
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89, 90	0	6	0	6
Engineering Drawing	169	0	3	0	12
Physical Training	269	0	2	0	2

Third Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Letters	68	..	..	..	..
Survey Camp	275	..	..	..	..
Geological Field Work	193	..	..	..	..
Engineering Chemistry	102	1	0	1	0
Theory of Structures	7	2	0	0	0
Hydraulics	205	2	0	2	0
Analytical Chemistry	88	1	0	1	0
Electricity	143	1	0	1	0
Assaying	45, 46	1	3	0	3
Economic Geology	202, 203	1	0	3	2
Dynamic and Structural Geology	198	1	0	0	0
Ore Dressing	58, 59	1	3	1	3
Physics of Ore Dressing	64	1	0	1	0
Mining	54	1	0	1	0
Petrography	262	1	0	1	0
Metallurgy	243	1	0	1	0

MINING ENGINEERING—THIRD YEAR—Cont.

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Physical Metallurgy	244	0	0	2	0
Commercial Law	124	1	0	1	0
Petrography Laboratory	263	0	2	0	2
Introductory Research	66	0	0	0	3
Chemical Laboratory	99	0	0	0	9
Mechanics of Materials Laboratory	9	0	0	0	3
Engineering Drawing	174	0	9	0	0

FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Letters	68	..	..	..	..
Thesis	67	0	7	0	10
Mine Cost Keeping and Management	56	1	0	1	0
Thermodynamics	223	1	0	1	0
Assaying	47, 48	0	0	1	3
Electrochemistry	107, 108	2	3	0	0
Geology, Pleistocene and Physiographic	194, 201	1	1	1	0
Geology, Precambrian	199	2	0	0	0
Geology, Mining	200	0	0	2	0
Metallurgy	247	1	0	1	6
Mining	55	1	0	1	0
Ore Dressing	60, 61	1	6	1	0
Engineering Economics	125	0	0	1	0
Metallography	251	0	0	0	3
Power: Electrical Lab'y	144 (*b*)	0	3	0	0
Power: Hydraulics Lab'y	210	0	0	0	3
Power: Thermodynamics Lab'y	224	0	3	0	0

3. DEPARTMENT OF MECHANICAL ENGINEERING

The course in Mechanical Engineering is intended to serve as a preliminary training for those who intend to take up work connected with the design, manufacture, installation, or operation of machinery for the use of power as generated by steam, gas, oil, and water, and machinery and methods for the production, transportation, and handling of material, heating, ventilation, refrigeration, compressing of air, pumping of water, and all problems of a mechanical nature, and administrative work in connection with both Engineering and Industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	5	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Illuminating Engineering	185	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	2

MECHANICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work.........	286	0	0	0	0
Calculus...............	237	1	0	1	0
Descriptive Geometry...	162	1	0	1	0
Dynamics..............	3	1	0	1	0
Mechanics of Materials..	4	2	0	2	0
Engineering Chemistry..	93	1	0	0	0
Inorganic Chemistry....	87A	1	0	0	0
Organic Chemistry......	95	0	0	1	0
Metallurgy.............	241	0	0	1	0
Hydrostatics...........	186	0	0	1	$1\frac{1}{2}$
Elementary Machine Design..................	232	1	0	1	0
Electricity............	136, 137	2	3	2	3
Steam Engines.........	216	1	0	1	0
Theory of Mechanism...	230	2	$1\frac{1}{2}$	2	$1\frac{1}{2}$
Economics and Finance..	123	1	0	1	0
Chemical Laboratory....	89	0	3	0	3
Engineering Drawing....	170	0	13	0	11
Physical Training.......	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry..	102	1	0	1	0
Theory of Structures....	7	2	0	0	0
Thermodynamics.......	217, 219	2	3	2	3
Hydraulics.............	205, 206	2	0	2	3
Heat Engines...........	218	2	0	2	0
Mechanics of Machinery.	231	1	0	1	0
Machine Design........	233	2	4	2	10
Magnetism Electricity..	138, 140	2	3	0	0
Alternating Current	139, 140	1	0	1	3
Physical Metallurgy.....	244	0	0	2	0
Compound Stress.......	10 (*a*)	1	0	0	0
Commercial Law........	124	1	0	1	0
Mechanics of Materials Laboratory..........	9	0	0	0	3
Engineering Drawing....	177	0	9	0	0

Mechanical Engineering—Fourth Year

(*a*) Power Plant Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis.................	285	0	0	0	0
Engineering Economics..	125	0	0	1	0
Structural Design.......	17, 18, 180	2	3	0	3
Electrical Laboratory....	144 (*c*)	0	0	0	3
Heat Treatment of Iron and Steel............	253	1	0	1	0
Machine Design........	235	2	7	1	6
Thermodynamics and Heat Engines.........	220, 221, 222	3	9	3	9
Hydraulics.............	207, 208, 209	3	8	3	8

Fourth Year

(*b*) Water Power Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis.................	285	0	0	0	0
Engineering Economics..	125	0	0	1	0
Structural Design.......	17, 18, 180	2	3	0	3
Electrical Laboratory....	144 (*c*)	0	0	0	3
Heat Treatment of Iron and Steel............	253	1	0	1	0
Machine Design........	235	2	5	1	7
Hydraulics.............	207, 208, 209	3	11	3	11
Mechanics of Materials..	13	0	6	0	3
Reinforced Concrete....	15	1	0	1	0
Foundations...........	14	1	0	1	0
Reinforced Concrete Design.............	181	0	3	0	3

MECHANICAL ENGINEERING—FOURTH YEAR

(c) Industrial Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	0	0	0
Engineering Economics	125	0	0	1	0
Structural Design	17, 18, 180	2	3	0	3
Electrical Laboratory	144 (c)	0	0	0	3
Heat Treatment of Iron and Steel	253	1	0	1	0
Heating, Ventilation and Refrigeration	226, 227, 228	1	3	1	3
Machine Design	235	2	6	1	8
Thermodynamics and Heat Engines	220, 221, 222	3	6	3	12
Hydraulics	209, 212	1	9	1	0
Industrial Management	130	1	0	1	0

4. DEPARTMENT OF ARCHITECTURE

The instruction in this department is arranged mainly to lay a broad foundation for the subsequent professional life of its graduates The curriculum is based on the belief that an architect should have an education in liberal studies, that he should understand and appreciate the other arts in their relation to architecture, and that his training in design should teach him to regard building construction as an expression of his art rather than as an end in itself With this object in view, the course in Architecture, which was originally derived from the Engineering courses, has been gradually broadened out to include an elementary training in the sister arts of painting and scultpure, and also courses in French and English.

FIRST YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	161	1	0	1	0
Statics	1	2	0	2	0
Building Measurements	37	1	2	1	0
Elements of Architecture	28	1	0	1	0
History of Architecture	25	1	3	1	0
Technical English	122(*a*)	1	0	1	0
French	266	2	0	2	0
Modelling	36	0	2	0	2
Freehand Drawing	35	0	3	0	2
Architectural Design Engineering Drawing	31 167	0	14	0	18
Physical Training	269	0	2	0	2

ARCHITECTURE—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work	286	..	..	..	..
Descriptive Geometry	163	1	0	1	0
Mechanics of Materials	5	2	0	2	0
Theory of Architectural Planning	32	1	0	1	0
History of Architecture	25 (a)	1	0	1	0
History of Ornament	29	1	0	1	0
Illumination	189	1	1½	1	1½
Economics and Finance	123	1	0	1	0
Technical English	122 (b)	1	0	1	0
French	266	2	0	2	0
Modelling	36 (a)	0	2	0	2
Freehand Drawing	35 (a)	0	3	0	3
Architectural Design / Engineering Drawing	31 (a) / 171	0	17	0	17
Physical Training	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work	287	..	..	..	..
Structural Design	18	2	0	2	0
Acoustics	190	1	1½	1	0
Building Materials	38	2	0	2	0
History of Architecture	25 (b)	1	0	1	0
History of Fine Art	30	1	0	1	0
Architectural Composition	33	1	0	1	0
Garden Design	27	0	0	1	0
Commercial Law	124	1	0	1	0
French	266	1	0	1	0
Modelling	36 (b)	0	2	0	2
Water Colour Painting	35 (b)	0	3	0	3
Architectural Design / Engineering Drawing	31 (b) / 175	0	18	0	18

ARCHITECTURE—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work	288	..	..	..	..
Thesis	286	0	3	0	3
Contracts and Specifications	127	0	0	1	0
Architectural Aspects of of Town Planning	34	0	0	1	0
Advanced Architectural Programmes	26	1	0	1	0
Garden Design	27(*a*)	0	0	1	0
Structural Design	16	1	3	1	3
Heating and Ventilating	40	1	0	1	0
Sanitary Science	39	1	0	1	0
Drawing from Life	35(*c*)	0	3	0	3
Modelling from Life	36(*c*)	0	2	0	2
AND ONE OF:					
Architectural Design	31(*c*)	2	24	2	22
Architectural Engineering	31(*d*), 16	4	22	3	20

6. DEPARTMENT OF CHEMICAL ENGINEERING

The course is designed to give the student a thorough training in Chemistry and its application to industry, as well as a general knowledge of the elements of thermodynamics, hydraulics, machine design, structural design, electricity and metallurgy. A preliminary training of this nature with subsequent practical experience will enable him to undertake the design and construction and also the operation and management of the plant required in such branches of chemical industry as are concerned with the production of chemical and pharmaceutical products, rubber goods, leather and glue, soap, meat products, food-stuffs, oils of all kinds, sugar, pulp and paper, illuminating gas, coal tar and wood distillates, paints and varnishes, explosives, dyes, glass, portland cement, metals and their alloys, electrochemical products, fermentation products, printers' inks, fertilizers, ceramic and building materials, etc.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Optics	185	1	2	1	2
Technical English	122(*a*)	1	0	1	0
German	267	1	0	1	0
Business	121	0	0	1	0
Mineralogy Laboratory	256	0	0	0	3
Biological Laboratory	80	0	3	0	3
Chemical Laboratory	86	0	10	0	10
Engineering Drawing	168	0	4	0	4
Physical Training	269	0	2	0	2

Chemical Engineering—Second Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	286				
Calculus	237	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Engineering Chemistry	93	1	0	0	0
Organic Chemistry	96	2	0	2	0
Metallurgy	241	0	0	1	0
Hydrostatics	186	0	0	1	1
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Industrial Chemistry	94	1	0	1	0
Physical Chemistry	98	2	0	2	0
Inorganic Chemistry	87A	1	0	0	0
Inorganic Chemistry	87B	0	0	1	0
German	267	1	0	1	0
Economics and Finance	123	1	0	1	0
Chemical Laboratory	92	0	10	0	12
Engineering Drawing	172	0	7	0	3
Physical Training	269	0	2	0	2

Third Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Theory of Structures	7	2	0	0	0
Thermodynamics	217, 224	2	2	2	0
Hydraulics	205, 206	2	0	2	1
Metallurgy	243	1	0	1	0
Physical Metallurgy	244	0	0	2	0
Assaying Laboratory	49	0	0	0	3
Analytical Chemistry	88	1	0	1	0
Electrochemistry	107, 108	2	3	0	0
Industrial Chemistry	103	1	0	1	0
Organic Chemistry	106	2	0	2	0
Chemical Plant	104	1	0	1	0
German	267	1	0	1	0
Commercial Law	124	1	0	1	0
Chemical Laboratory	100	0	7	0	13
Engineering Drawing	177	0	6	0	0
Electrical Laboratory	144 (*d*)	0	0	0	3

CHEMICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis....................	285				
Industrial Management....	130	1	0	1	0
Machine Design..........	234	1	0	1	3
German.................	267	1	0	1	0
or Spanish.............	268	1	0	1	0
Inorganic Chemistry......	109	2	0	2	0
Organic Chemistry........	110	1	0	1	0
AND ONE OF:					
Electrochemistry........	114, 115	2	*	2	*
Industrial Chemistry....	112, 113	1	*	1	*
Sanitary and Forensic Chemistry and Bacteriology...........	116	1	*	2	*
Metallurgy.............	247	1	*	1	*
Physical Metallurgy.....	250	1	*	1	*
Zymology.............	283	*	*	*	*

*All time not otherwise allotted must be spent in the various laboratories in the proportions assigned by the Department.

7. DEPARTMENT OF ELECTRICAL ENGINEERING

The course in electrical engineering is designed for those who are looking forward to work in connection with the design, manufacture, installation, or operation of electrical machinery and equipment for the generation, transmission, and utilization of power, for domestic and industrial purposes including its many applications to problems of intercommunication in connection with railway, telephone, telegraph, or radio equipment, to work in connection with electrochemical processes, and to administrative work in connection with both Engineering and Industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	5	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Illuminating Engineering	185	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	0

ELECTRICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	286				
Calculus	237	1	0	1	0
Descriptive Geometry	162	1	0	1	0
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Engineering Chemistry	93	1	0	0	0
Organic Chemistry	95	0	0	1	0
Inorganic Chemistry	87A	1	0	0	0
Hydrostatics	186	0	0	1	1½
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Steam Engines	216	1	0	1	0
Theory of Mechanism	230	2	1½	2	1½
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89	0	3	0	3
Engineering Drawing	170	0	12	0	12
Physical Training	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Thermodynamics	217, 219	2	2	2	1½
Hydraulics	205, 206	2	0	2	1
Heat Engines	218	1	0	1	0
Mechanics of Machinery	231	1	0	1	0
Machine Design	233	2	4½	2	4½
Alternating Current	139	1	0	2	0
Physical Metallurgy	244	0	0	2	0
Electrochemistry	107, 108	2	3	0	0
Magnetism and Electricity	138	2	0	1	0
Electrical Design	141, 142	1	3	1	3
Commercial Law	124	1	0	1	0
Electrical Laboratory	140	0	6	0	6

ELECTRICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285				
Engineering Economics	125	0	0	1	0
Industrial Management	130	1	0	1	0
Applied Electricity	145, 146	4	20	4	19
AND ONE OF:					
Hydraulics	207, 208, 209	3	9	3	10
Thermodynamics	220, 221, 222	3	9	3	9
Electrochemistry	114, 115	2	9	2	9
OR:					
Radiotelegraphy	147, 148	2	9	2	9
and					
Acoustics	190	1	1	0	0

8. DEPARTMENT OF METALLURGICAL ENGINEERING

This course is designed for those who intend to take up work in connection with the production, treatment and working of metals for the purposes of industry; or the design, construction, or operation of metallurgical plants including smelters, furnaces, foundries, refineries, and lixiviation works; and administrative work in connection with both Engineering and Industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	5	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Technical English	122(*a*)	1	0	1	0
Business	121	0	0	1	0
Mineralogy Laboratory	256	0	0	0	3
Engineering Drawing	166	0	11	0	14
Physical Training	269	0	2	0	2

Second Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Chemistry	87A, 87B, 88, 91	2	14	1	13
Metallurgy	241, 242	1	0	2	0
Geology and Ore Deposits	196	1	1	1	1
Steam Engines	216	1	0	0	0
Electricity	136, 137	2	3	2	3
Spanish	268	1	0	1	0
Economics and Finance	123	1	0	1	0
Engineering Drawing	172	0	3	0	6
Physical Training	269	0	2	0	2

Metallurgical Engineering—Third Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry..	102	1	0	1	0
Cements and Concrete...	11	0	0	1	0
Heat Engines...........	218	1	0	1	0
Electricity.............	143, 144 (*e*)	1	3	1	3
Electrochemistry........	107, 108	2	3	0	0
Assaying................	45, 46	1	3	0	3
Ore Dressing...........	58, 59	1	3	1	3
Mining.................	51, 52	1	0	1	0
Metallurgy.............	245	2	3	1	6
Physical Metallurgy.....	246	1	3	1	0
Machine Design.... ...	234	1	0	1	3
Commercial Law........	124	1	0	1	0
Chemical Laboratory....	101	0	0	0	6
Engineering Drawing....	182	0	3	0	0
Analytical Chemistry....	88	1	0	1	0

Fourth Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis..................	285	0	6	0	6
Engineering Economics..	125	0	0	1	0
Contracts and Specifications...............	127	0	0	1	0
Plant Management......	129	0	0	1	0
Thermodynamics.......	223	1	0	1	0
Assaying................	47, 48	0	0	1	3
Ore Dressing...........	60, 61	1	6	1	0
Electrochemistry........	114, 115	2	3	2	3
Metallurgy.............	249	1	0	1	0
Metallurgy Problems....	248	2	6	2	6
Physical Metallurgy.....	250	1	3	1	3
Power: Thermodynamic Laboratory....	224	0	3	0	0
Power: Hydraulic Laboratory.......	210	0	0	0	3

OUTLINE OF LECTURE AND LABORATORY COURSES PROCEEDING TO BACHELOR DEGREES

On the following pages the courses of instruction are set forth in detail. The time devoted to the various subjects, both for lectures and practical work, is indicated as accurately as possible; the hours, however, shown in the prescriptive schedules on pages 39 to 61 will govern.

The curriculum as printed is intended to cover the prescription for the current year only and does not imply the right of a student to have the course unchanged during any subsequent year of his attendance.

The courses are designed to give the student a sound training in the fundamental scientific principles on which the various branches of engineering are based. The instruction is given by means of lectures and practical work in the laboratories, the drafting rooms and the field.

The courses in the first two years are devoted to the theoretical and essential scientific requirements of the engineering profession as a whole, with an introduction in a few cases of the practical application of these to engineering problems.

In the third and fourth years, the subjects of the former years are continued with particular attention paid to their application to modern engineering practice in the problems of design, erection, installation and operation peculiar to the several branches of the profession.

APPLIED MECHANICS

1. *Statics:*—T. R. Loudon.
   All Departments, I Year; 2 hours per week, both terms.
   This course of lectures deals with forces in a single plane, and concerns chiefly the calculation of tension, compression and shearing stresses in frame structures and solid beams.

2. *Dynamics:*—T. R. Loudon.
   Departments 1, 2, 3, 6, 7, 8, I Year; 2 hours per week; both terms.
   This course of lectures deals with bodies having motion of translation in one plane; also with relative motion, momentum, work and energy.

   Text Book:—Tutorial Dynamics—Briggs and Bryan.

3. *Dynamics of Rotation:*—W. J. Loudon.
   Departments 1, 2, 3, 7, 8, II Year; 1 hour per week; both terms.
   This course covers angular motion, including moments of inertia, simple harmonic motion, the pendulum, centres of mass, suspension and percussion, the simple theory of the fly-wheel and the governor.

   Text Book:—Dynamics of Rotation—Loudon.

4. *Mechanics of Materials:*—P. Gillespie.
Departments 1, 2, 3, 6, 7, 8, II Year; 2 hours per week; both terms.
In this course the strength and elasticity of materials are mathematically treated. The stresses in such elements of structures as the tie rod, the beam, the strut and the member subjected to shear are investigated and the elementary principles of design established. In the lecture and drafting rooms through numerous problems involving the design of simple beams, columns, riveted connections, etc., these principles are exemplified. The work includes also the discussion of eccentric loading, suddenly applied loads and repeated stresses.
Reference Book:—Mechanics of Materials—Merriman.

5. *Mechanics of Materials:*—T. R. Loudon.
Department 4, II Year; 2 hours per week; both terms.
This course deals with the mathematical consideration of stress and elasticity. Among the problems taken up are the consideration of riveted joints, theory of simple and continuous beams, the theory of columns and simple column footings.
Text:—Strength of Materials—Boyd.

6. *Theory of Structures:*—C. R. Young.
Department 1, III Year; 2 hours per week; both terms.
The work of the first term comprises a thorough discussion of combined stresses, columns, restrained, continuous and trussed beams, multiple section and box girders, and plate girders. A number of designs of structures and structural details are worked out in the class and drafting rooms.
The second term is given chiefly to the design of a riveted truss highway span and a riveted truss railway span, the complete designs being made in the lecture and drafting rooms.
Text Books:—Modern Framed Structures, Part III—Johnson, Bryan and Turneaure; Structural Members and Connections—Hool and Kinne; Structural Problems—Young; Carnegie Pocket Companion; Cambria Steel.

7. *Theory of Structures:*—C. R. Young.
Departments 2, 3, 6, III Year; 2 hours per week; first term.
The work is practically the same as that for Department I in the first term.

8. *Structural Design:*—T. R. Loudon, W. J. T. Wright.
Department 4, III Year; 2 hours per week; both terms.
During the first term, the economics of the design of floor systems in timber and structural steel are discussed. The design of masonry piers, structural steel and timber columns is also gone into in the first term.
The second term is taken up in the discussion of the design of roof trusses and an introduction to reinforced concrete.

9. *Mechanics of Materials:*—P. Gillespie.
Departments 1, 2, 3, III Year; 3 hours per week; one term.
This laboratory course is intended to give the student an introduction to the experimental study of the strength and elasticity of materials. It is intended that he shall acquire some familiarity with the construction and operation of testing machines and with the properties of the ordinary building materials.
Reference:—Laboratory Instruction Sheets, Department of Civil Engineering and Applied Mechanics, U. of T., 1922.

10. *Stress Graphics:*—T. R. Loudon.
Department 1, III Year; one hour per week; both terms.
This course of lectures deals mainly with graphic methods of solving stresses in framed structures. The construction of Shearing Force diagrams, Bending Moment diagrams and Influence Lines is also dealt with.
Text Book:—Graphic Analysis—Wolfe.

10(*a*). *Compound Stress:*—T. R. Loudon.
Department 3, III Year; one hour per week, first term.
This course deals mainly with the discussion of methods determining the stress conditions in bodies subjected to compound stress. Both analytical and graphical methods of analysis are discussed.

11. *Cements and Concrete:*—P. Gillespie.
Departments, 1, 8, III Year; one hour per week; second term.
The manufacture, testing and use of Portland cement and the fundamentals of the theory of reinforced concrete are discussed in this course of lectures.

12. *Theory of Structures:*—C. R. Young.
Departments 1_c, 1_d, 1_e, IV Year; 2 hours per week; both terms.
The work comprised in this course of lectures concerns swing bridges, arches, suspension bridges, cantilever bridges, deflections, and secondary stresses. Problems based on the lectures are worked out in the drafting rooms.
Reference Books:—Modern Framed Structures, Part II—Johnson, Bryan and Turneaure; Theory of Structures—Spofford.

13. *Mechanics of Materials:*—P. Gillespie.
Departments 1, 3, IV Year; a laboratory course of 3 hours per week one term and 6 hours per week the other term.
This course of experiments is intended to give the student practice in investigating the elastic and physical properties of iron, steel, concrete, timber, etc., and in the use of instruments of precision designed for that purpose.
Reference Book:—Materials of Construction—Johnson.

14. *Foundations, Retaining Walls and Dams:*—P. Gillespie, W. J. Smither. Department 1, IV Year; Department 3, IV Year, Option (b); 1 hour per week; both terms.

This course of lectures is devoted to the design of the structures mentioned. Preparatory to the discussion of the practical aspects of the subjects, and in order to gain familiarity with the fundamental principles involved, a part of the first term is given over to the consideration of the theory of compound stress. The most approved forms of construction of retaining walls, footings, abutments, piers and dams are then described, and typical designs are worked out in the class and drafting rooms.

Some attention is also given to the principles of formula charting.

Text Books and Books of Reference:—Retaining Walls for Earth—M. A. Howe; Walls, Bins and Grain Elevators—M. S. Ketchum; A Treatise on Masonry Construction—I. O. Baker; Design and Construction of Dams—E. Wegmann.

15. *Reinforced Concrete:*—P. Gillespie.

Department 1, IV Year; Department 3, IV Year, Option (b); 1 hour per week; both terms.

The theory of the strength of reinforced concrete elements including the beam, the slab, the T-beam, the column and the footing, is continued in this course.

The analysis of the monolithic arch by the elastic theory is discussed, and the student is required in the drafting room to apply his knowledge to the design of simple structures.

Reference books:—Principles of Reinforced Concrete Construction—Turneaure and Maurer; Reinforced Concrete Construction, Vol. I—Hool.

16. *Structural Design:*—T. R. Loudon.

Department 4, IV Year; 1 hour lecture and 3 hours laboratory per week; both terms.

During this course of lectures, the economics of the design of buildings in reinforced concrete and steel are discussed. This course of lectures is supplemented by the actual designing of buildings in the drafting room.

Text:—Principles of Reinforced Concrete—Turneaure and Maurer.

17. *Structural Design:*—C. R. Young, W. J. Smither.

Department 1_c, 1_d, IV Year; 1 hour per week; both terms.

Department 1_b and 3, IV Year; 1 hour per week; first term.

This course of lectures is devoted to the problems connected with the structural design of buildings of timber, steel and reinforced concrete. The various structural elements such as the floors, columns, footings, walls and wind bracing, are fully discussed, and portions of typical buildings are designed in the class and drafting rooms.

Text Books:—Handbook of Building Construction—Hool and Johnson; Architects' and Builders' Handbook—Kidder—Nolan.

18. *Structural Design:*—C. R. Young, W. J. Smither.
Departments 1_c, 1_d, and 3, IV Year; 1 hour per week; first term.
Consideration is given in this course to the various types of mill buildings, to the conditions governing the choice and to the details of construction in different materials. Designs of portions of mill buildings are worked out in the class and drafting rooms.
Text Books:—Steel Mill Buildings—Ketchum. Mill Buildings—Tyrrell.

19. *Miscellaneous Structures:*—W. J. Smither.
Department 1, IV Year; 1 hour per week; second term.
In this course of lectures the application of theoretical principles to the design of a variety of structures is made. Among those structures discussed are, transmission line towers, elevated tanks and their supporting towers, standpipes, large pressure pipes, sewers, culverts, small highway bridges, sub-surface tanks and tall chimneys. Whenever possible the lecture work is followed up by designs in the drafting room.

20. *Railway Structures:*—C. R. Young.
Department 1_e, IV Year; 1 hour per week; first term.
A course of lectures with exercises covering alternative bridge layouts with comparative estimates of costs, temporary and permanent trestles, tunnels, tunnels vs. bridges, buildings, turntables, snow sheds and shelters.

ARCHITECTURE

25. *History of Architecture:*—H. H. Madill, E. R. Arthur.
Department 4, I Year; 1 hour per week; both terms.
In this course the development of architecture is traced from Prehistoric times to the Early Romanesque.

25*a*. *History of Architecture:*—H. H. Madill, E. R. Arthur.
Department 4, II Year; 1 hour per week; both terms.
In this course the development of architecture is traced from the Romanesque Period to the present time.

25*b*. *History of Architecture:*—H. H. Madill, E. R. Arthur.
Department 4, III Year; 1 hour per week; both terms.
In this course the work of the Renaissance in Italy, France and England is taken in greater detail than was possible in the broad field covered in the previous year.

26. *Advanced Architectural Programmes:*—H. H. Madill, E. R. Arthur.
Department 4, IV Year; 1 hour per week; both terms.
In this course of lectures the principles underlying the planning of such large buildings as Churches, Departmental Stores, Theatres, Schools, Railway Stations, etc., are discussed in detail.

27. *Garden Design:*—H. B. Dunington-Grubb.
Department 4, III Year.
In this course the historical development of Garden Design is traced from earliest times; the study of sites; the influence of topography, orientation, access, etc., on the problems of design; site planning; the location of buildings; the solution of an actual problem on a typical site.

27*a*. *Garden Design:*—H. B. Dunington-Grubb.
Department 4; IV Year.
The work of the previous year is continued and a problem is set in the studio involving principles of both architectural and garden design.

28. *Elements of Architectural Form:*—E. R. Arthur.
Department 4, I Year; 1 hour per week; both terms.
Lectures on the Five Orders of Architecture, their affiliated forms and other elements used in design. This course is preliminary to the lectures given in the II Year on the Theory of Architectural Planning.

29. *Architectural Ornament:*—H. H. Madill.
Department 4, II Year; 1 hour per week; both terms.
In this course the development of Ornament is traced from the beginning through Egyptian, Assyrian, Grecian, Roman, Byzantine, Romanesque, Gothic and Renaissance styles. An attempt is made to analyze ornament of the best periods and to systematize the principles followed in form and colour.

30. *History of Fine Art:*—C. W. Jefferys, F. Coates.
Department 4, III Year; 1 hour per week; both terms.
The course consists of an outline of the history and development of painting and of the minor pictorial arts from the earliest time until the present day; followed by an outline of the history and development of the different eras of sculpture ranging from the primitive to the present day.

31. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, I Year.
This comprises work done in the Studio, including lettering, the drawing and rendering of the Orders and such elementary motives as a door, a window, etc.
This is followed by a drawing in which the Classic orders and ornament taken from a particular building are arranged in the form of a composition, and by an elementary problem in design.

31*a*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, II Year.
This course is given by means of individual instruction in the studio and by criticisms of the solutions of different problems set during the year. It is in this course that the student begins the serious

study of design; continued practice in architectural drawing and rendering affords the training necessary to make of the student a proficient draughtsman.

31*b*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, III Year.
This course is given by individual instruction in the studio and by criticisms of solutions of problems set during the year. The greater part of the course is devoted to problems in design and forms a continuation of the course given in the preceding year.

31*c*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, IV Year.
This course is a continuation of the work of the preceding years, being given by individual instruction in the studio and criticisms of the solution of problems set during the year.
During the second term architectural working drawings of a building designed by the student are prepared in the studio.

31*d*. *Architectural Design:*—T. R. Loudon, H. H. Madill, E. R. Arthur.
Department 4, IV Year; Architectural Engineering Option.
In this course the design and preparation of working drawings and structural details of work of a monumental character is carried on in the studio.

32. *Theory of Architectural Planning:*—E. R. Arthur.
Department 4, II Year.
In this course special attention is given to the elements and general principles of architectural planning.

33. *Architectural Composition:*—E. R. Arthur.
Department 4, III Year.
This course consists of a series of lectures on the theory of architectural design, the analysis of composition, proportion, scale, etc.

34. *Architectural Aspects of Town Planning:*—E. R. Arthur.
Department 4, IV Year.
In this course of lectures the Historical Development of Town Planning is traced with particular reference to the Axial Planning of the Renaissance, Public Squares, the Grouping of Buildings and the placing of Monuments.

35. *Freehand Drawing and Water Colour Painting:*—C. W. Jefferys.
Department 4, I Year; 3 hours per week; both terms.
Drawing from still life objects. Primary free hand perspective. Primary pencil, charcoal, and pen and ink rendering.

35*a*. Department 4, II Year; 3 hours per week; both terms.
Drawing and monochrome painting from still life.
Drawing from the cast.
Pencil, pen and ink, and monochrome rendering.
Primary water colour.
Drawing from landscape and natural objects.

35*b*. Department 4, III Year; 3 hours per week; both terms.
Drawing from the cast.
Water colour from still life. Water colour rendering.
Drawing from landscape and natural objects.
Students who are sufficiently advanced are admitted to the Fourth Year Life Drawing Class.

35*c*. Department 4, IV Year; 3 hours per week; both terms.
Water colour from still life and from landscape.
Drawing from life.
Water colour rendering.

36. *Modelling:*—Frederick Coates.
Department 4, I Year; 2 hours per week; both terms.
The Orders. Synopsis of styles.

36*a*. Department 4, II Year; 2 hours per week; both terms.
Problems in figures and in relation to architecture.

36*b*. Department 4, III Year; 2 hours per week; both terms.
Styles continued.
Problems, combination of figure, ornament and architecture and their relative values.

36*c*. Department 4, IV Year; 2 hours per week; both terms.
Modelling from life.
Anatomy.
Composition of groups.

37. *Building Measurement:*—C. H. C. Wright.
Department 4, 1 Year; 1 hour per week; both terms.
In this course of lectures the principles of measurements and mensuration with special reference to buildings will be discussed. With this is combined practice in measurements of existing buildings, quantities, etc.

38. *Building Materials:*—C. H. C. Wright.
Department 4, III Year; 2 hours per week; both terms.
The structural and aesthetic value of the various building materials.

39. *Sanitary Science:*—H. H. Madill.
Department 4, IV Year; 1 hour per week; both terms.
Modern plumbing, its design and installation, drainage, sewerage disposal and water supply.

40. *Heating and Ventilating:*—C. H. C. Wright.
Department 4, IV Year; 1 hour per week; both terms.
The design of different systems, where they should be used, heating specifications, etc.

ASSAYING, MINING AND ORE DRESSING

The work in Mining is directed more to the development of the proper attitude of mind towards mining problems than to the teaching of actual mining methods.

The teaching of Assaying has a two-fold function. The first is to give the student a working knowledge of the practice of the art, so that he can earn money as an assayer on graduation and use this as a stepping-stone to other positions. The second is to use the assaying laboratories for the training of the students in certain important phases of Engineering methods. The size of the apparatus, the completeness of the processes in short intervals of time, the extreme accuracy of results when so desired, the relation of the extent of error to time and method, the similarity of the academic laboratory to the field laboratory, all these permit an unrivalled opportunity for driving home much broad Engineering philosophy. The assaying processes and apparatus lend themselves peculiarly well for the development of a proper perspective in regard to errors and accuracy in measurements.

The study of Ore Dressing, when accompanied by laboratory work in a well equipped ore dressing laboratory, is one of the most important of the Mining Engineering subjects. Not only is the mechanical treatment of ores a very important branch of Mining Engineering, but the mental processes involved in a study of the fundamental principles underlying the art and the compromise necessary for field practice form one of the best fields for the development of Engineering philosophy. From these points of view the ore dressing laboratory is exceptionally well equipped.

45. *Assaying:*—J. T. King.

Departments 2 and 8, III Year; 1 hour per week; first term.

A first course of lectures on the theory of fire assaying. Emphasis is laid not only on the chemical and metallurgical principles involved, but upon the errors inherent in operators as well as in methods.

Text Book:—Manual of Fire Assaying—Fulton.

46. *Assaying:*—J. T. King.

Departments 2 and 8, III Year; 3 hours per week; both terms.

A laboratory course in the determination of the precious metals in ores, milling and metallurgical products. Scorification and crucible assays of ores and products, pure and impure, fluxes, slags and solutions. Buckboard practice, ores with metallics. Copper and lead by electrolysis. Students are expected to do their later assays with despatch and a reasonable degree of accuracy. Neatness of work is required.

47. *Assaying:*—J. T. King.
Departments 2 and 8, IV Year; 1 hour lecture per week; second term.
A continuation of course 45. Complex ores. Combination assays. The sampling and assay of bullion. The Platinum group metals. Checks and corrections.

48. *Assaying:*—J. T. King.
Departments 2 and 8, IV Year; 3 hours per week; second term.
An advanced laboratory course in which some of the methods of course 47 are used.

49. *Assaying:*—J. T. King.
Department 6, III Year; 3 hours per week; one term.
An introductory laboratory course for Chemical Engineers. Some lecture instruction is given. An abbreviation of courses 45 and 46.

50. *Mining:*—H. E. T. Haultain and F. C. Dyer.
Department 2, I Year; 3 hours per week; second term.
A laboratory course, including some lectures, being an introduction to certain mining and milling machinery and methods.

51. *Mining:*—H. E. T. Haultain.
Department 2, II Year and Department 8, III Year; 1 hour per week; first term.
An introductory course of lectures.

52. *Mining:*—H. E. T. Haultain.
Department 8, III Year; 1 hour per week; second term.
An extension of No. 51.

53. *Mining:*—F. C. Dyer.
Department 2, II Year; 3 hours per week; one term.
Continuation of No. 50. Rock drills, sampling methods, use of explosives.

54. *Mining:*—H. E. T. Haultain and F. C. Dyer.
Department 2, III Year; 2 hours per week; second term.
Principles of mining.

55. *Mining:*—H. E. T. Haultain.
Department 2, IV Year; 1 hour per week; both terms.
Special problems, estimates, reports.

56. *Mine Cost Keeping and Management:*—H. E. T. Haultain.
Department 2, IV Year; 1 hour per week; both terms.
One of the fundamental features that must not be lost sight of by the Mining Engineer is, that his work is designed primarily for purposes of financial profit. This course of lectures deals with

details from this point of view. The total cost of a ton of ore requiring as it does an understanding of the problems of amortization, is first dealt with in a broad way. Then are considered various problems of cost keeping, leading on to problems of time and motion study which are essential to the development of the fine points of the art in any particular mining problem. The latter part of the course deals with problems of management, the relations of members of the staff to each other, and the relations of the staff to labour.

58. *Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Departments 2 and 8, III Year; 1 hour per week; both terms.
The general principles of Ore dressing.

59. *Ore Dressing:*—F. C. Dyer.
Departments 2 and 8, III Year; 3 hours per week; both terms.
Work with crushing machinery, principles of crushing and grading screen analyses, concentration with gravity separation apparatus, etc.

60. *Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Departments 2 and 8, IV Year; 1 hour per week; both terms.
No. 58 continued, study of flow sheets and special problems.

61. *Ore Dressing:*—F. C. Dyer.
Departments 2 and 8, IV Year; 6 continuous hours per week; one term.
Advanced work with ore dressing appliances, ore testing and check mill runs.

62. *Ore Dressing:*—F. C. Dyer.
Department 6*k*, IV Year; 1 hour per week; both terms.
General principles of ore dressing.

63. *Ore Dressing:*—F. C. Dyer.
Department 6*k*, IV Year; 1 period of 6 hours per week; second term.
Principles of sampling, crushing and grading, screen analyses, concentration with gravity separation apparatus, flotation, ore testing, etc.

64. *Physics of Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Department 2, III Year; 1 hour per week; both terms.
Ore dressing methods involve a study of the laws governing the phenomena of surface tension, capillarity and colloidal solutions, in addition to those of hydrostatics and certain phases of hydraulics. This is embodied in a special course of lectures in conjunction with laboratory work in the Ore dressing laboratory.

65. *Theory of Measurement:*—H. E. T. Haultain.

Department 2, II Year; 1 hour per week; one term.

This title is not an entirely suitable one for this course of lectures because it is generally applied to a study of the philosophy of extremely accurate measurements. The Mining Engineer has to continually make satisfactory use of measurements with a wide range of inaccuracy. This course of lectures deals with the philosophy underlying the causes of these errors and the practical application of such approximations. The opportunity is taken in these lectures to deal with the subject of illustrating measurements by graphs.

66. *Introductory Research:*—H. E. T. Haultain and F. C. Dyer.

Department 2, III Year; 3 hours per week; second term.

This is a laboratory course including some lectures and is a preparation for the thesis of the fourth year.

67. *Thesis.*

Department 2, IV Year; 7 hours per week; first term; 10 hours per week, second term, in continuous periods.

Thesis in this department consists mainly in reports on original work done in the laboratories. In the III year the subject "Introductory Research" paves the way for the thesis. During the month of October the student decides on the subject of his thesis in consultation with his professors. After this is decided the student uses his own initiative in the development of his work.

The thesis is divided into three parts. The first part, which is handed in during the first week in November, contains the title, a statement of what the title is meant to convey and an outline of the work that is proposed to be done. The second part is handed in during the first week of January and contains a report of progress to date and enables the professor in charge to keep in closer touch with the work. The third and final part is handed in a week before the examinations and is a report of progress to date with final conclusions. The three parts combined constitute the thesis.

68. *Vacation Letters.*

Department 2, III Year and IV Year.

These are a series of letters written during the summer vacation, dealing with various aspects of a mining engineer's work. They are intended to direct and help the student's powers of observation, analysis and criticism as well as being exercises in the art of lucid technical expression. See page 30 for instructions.

69. *Vacation Work.*

Department 2, II Year.

See page 30 for detailed instructions.

ASTRONOMY AND GEODESY

71. *Astronomy, Elementary:*—C. A. Chant.

Department 1, II Year; 1 hour per week, both terms.

A course in descriptive Astronomy, explaining the ordinary astronomical terms, and describing the various celestial bodies and their motions. In the evenings opportunity will be given for identifying the stars and for observing with telescopes.

Text book:—Manual of Astronomy—C. A. Young.

72. *Astronomy and Geodesy:*—L. B. Stewart.

Department 1, III Year; 2 hours per week.

The course of lectures deals with the determination of time, latitude, longitude and azimuth, by methods adapted to the use of the surveyor's transit and the sextant. It is designed to fulfil the requirements of the final examinations for Ontario and Dominion Land Surveyors.

In Geodesy an account is given of the principles and methods of a secondary triangulation survey, also of the principles involved in the North-West system of survey.

Text books:—Practical Astronomy as applied to Geodesy and Navigation—Doolittle; Nautical Almanac, 1925.

73. *Field Work:*—L. B. Stewart, S. R. Crerar.

Department 1, III Year; about 2 hours per week, first term.

The practical work in this subject comprises observations in the field with the transit and sextant for the determination of time, latitude and azimuth by the methods described in the lectures.

74. *Astronomy (Advanced):*—L. B. Stewart.

Department 1, IV Year; 2 hours per week.

The lecture course in this subject comprises the theory and adjustment of the instruments used in connection with a geodetic survey; the methods of taking and reducing observations for time, longitude, latitude, and azimuth, with the precision required on such a survey; and other matters relating to these subjects.

75. *Geodesy and Metrology:*—L. B. Stewart.

Department 1, IV Year; 2 hours per week.

The lecture course includes a description of the methods of measuring base lines and the angles of a triangulation; the geometry of the spheroid with applications to geodetic problems; the computation of geodetic positions; the solution of large triangles on the earth's surface, and the adjustment of a triangulation; trigonometric and precise spirit levelling; the determination of the figure of the earth by arc measurements, and by the pendulum; the theory of map projections, etc.

76. *Astronomy, Geodesy and Metrology:*—L. B. Stewart.
Department 1, IV Year; about 23 hours per week.
The practical work in the above subjects includes the observation of meridian transits for time and longitude determinations, and of prime vertical transits for latitude, with the astronomical transit instrument; the observation of meridian zenith distances of stars, and of azimuths at elongation for latitude, with the alt-azimuth; theodolite observations for azimuth; observations for latitude with the zenith telescope; the investigation of the constants of the instruments used, and the reduction of all observations; the measurement of a base line with the steel tape and with invar wires, and the determination of the constants of the tape; the measurement of the angles of a triangulation and the adjustment of the angles of network of triangles, etc. A portion of this work will be taken at the Summer Survey Camp. (See page 32.)

BIOLOGY

80. *Elementary Biology:*—J. H. Faull.
Department 6, I Year; 3 hours per week, each term.
An elementary laboratory course on the nature and identification of plant and animal tissues and products, with microscope practice.

81. *Elementary Biology:*—J. W. MacArthur.
Department 1_b, IV Year.
A special Course of Laboratory work and demonstrations in General Biology, five hours per week, first term.

82. *Hygiene and Bacteriology:*—D. T. Fraser and R. R. McClenahan.
Departments 1_b and 6, IV Year.
(1) This is a course of twenty-five lectures, dealing with the principles of Hygiene and Sanitary Science and including a discussion of the facts in Bacteriology which are necessary for a proper understanding of Hygiene and Sanitary Science. The particular phases of the subject which are of importance from the standpoint of Sanitary Engineering are dealt with.
(2) This is a laboratory course of six hours per week, second term, dealing especially with the Bacteriology of water, milk and sewage.

CHEMISTRY

85. *Elementary Chemistry:*—E. G. R. Ardagh.
Departments 1, 2, 3, 6, 7, 8, I Year; 2 hours per week, first term; 1 hour per week, second term.
A lecture course in elementary chemistry dealing with the non-metals, with experimental illustrations.

86. *Inorganic Chemistry:*—L. J. Rogers.
Department 6, I Year; 10 hours per week, both terms.
A laboratory course of quantitative experiments illustrating the use of the sensitive balance, and confirming the fundamental laws of chemistry; qualitative inorganic analysis; quantitative analysis of pure salts; inorganic preparations; molar weight determinations.
Text books:—Analytical Chemistry, Vol. II—Treadwell-Hall; Qualitative Chemical Analysis—A. A. Noyes.

87A. *Inorganic Chemistry A:*—E. G. R. Ardagh.
Departments 1, 2, 3, 6, 7 and 8, II Year; 1 hour per week, first term.
A continuation of Course 85 dealing especially with the metals.

87B. *Inorganic Chemistry B:*—E. G. R. Ardagh.
Departments 2, 6 and 8, II Year; 1 hour per week, second term.
A lecture course on theoretical chemistry with special reference to the metals; a continuation of Course 85.
Text book:— Smith's College Chemistry—Kendall.

88. *Analytical Chemistry:*—L. J. Rogers.
Departments 2, 6 and 8, III Year; 1 hour per week, both terms.
A lecture course on the principles of chemical analysis; select gravimetric and volumetric methods; technical analysis.

89. *Analytical Chemistry:*—E. G. R. Ardagh.
Departments 1, 2, 3 and 7, II Year; 3 hours per week.
Laboratory practice in elementary qualitative and quantitative analysis.
Text book:—A Smaller Chemical Analysis—Newth.

90. *Analytical Chemistry:*—J. W. Bain.
Department 2, II Year; 3 hours per week, both terms.
A laboratory course in the gravimetric determination of metals and acids, with elementary volumetric analysis.
Text book:—A Manual of Chemical Analysis, Qualitative and Quantitative—Newth.

91. *Analytical Chemistry:*—L. J. Rogers.
Department 8, II Year; about 12 hours per week.
A laboratory course comprising gravimetric and volumetric methods, acidimetry and alkalimetry.
Text books:—Analytical Chemistry, Vol. II—Treadwell-Hall; Qualitative Chemical Analysis—A. A. Noyes.

92. *Analytical Chemistry:*—L. J. Rogers.
Department 6, II Year; 180 hours.
A laboratory course in quantitative chemical analysis; inorganic preparations.
Text book:—Analytical Chemistry, Vol. II—Treadwell-Hall.

93. *Engineering Chemistry:*—J. W. Bain.
Departments 1, 3, 6 and 7, II Year; 1 hour per week, first term.
A lecture course consisting of a study of the industrial production and application of heat and light, and of the chemistry of fuel and the products of combustion.

94. *Industrial Chemistry:*—J. W. Bain.
Department 6, II Year; 1 hour per week, both terms.
A lecture course on the manufacture of salts, acids, alkalies and inorganic chemicals.

95. *Organic Chemistry:*—M. C. Boswell.
Departments 1, 2, 3 and 7, II Year; 1 hour per week, second term.
A lecture course in elementary organic chemistry.

96. *Organic Chemistry:*—M. C. Boswell.
Department 2, III Year; 9 hours per week, second term.
A lecture course dealing with the aliphatic compounds.

97. *Organic Chemistry:*—M. C. Boswell.
Department 6, II Year; 60 hours.
A laboratory course in organic preparations.

98. *Physical Chemistry:*—F. B. Kenrick.
Departments 6, II Year; 2 hours per week, both terms.
A course of lectures on the elements of chemical mechanics, and the theory of solutions.

99. *Analytical Chemistry:*—L. J. Rogers.
Department 2, III Year; 9 hours per week, second term.
A laboratory course on the technical analysis of ores and furnace products.

100. *Industrial Chemistry:*—E. G. R. Ardagh.
Department 6, III Year; about 10 hours per week.
A laboratory course in industrial chemistry

101. *Analytical Chemistry and Phase Rule:*—L. J. Rogers, J. T. Burt-Gerrans.
Department 8, III Year; about 6 hours per week.
A laboratory course in analysis and phase rule.

102. *Engineering Chemistry:*—J. W. Bain, E. G. R. Ardagh.
Departments 1, 2, 3, 6, 7 and 8, III Year; 1 hour per week, both terms.
A lecture course on the application of chemistry to engineering problems; air, water, sewage, the materials of construction, explosives, etc.

103. *Industrial Chemistry:*—E. G. R. Ardagh.
Department 6, III Year; 1 hour per week, both terms.
A lecture course on petroleum and its products, coal tar and its products; fats, oils, soap, sugar, starch, and gums; fermentation industries, etc.

104. *Chemical Plant:*—J. W. Bain.
Department 6, III Year; 1 hour per week, both terms.
A lecture course on the machinery and plant used in chemical manufacturing.

105. *Organic Chemistry:*—M. C. Boswell.
Department 6, III Year; 2 hours per week, both terms.
A lecture course on the aromatic series.

106. *Organic Chemistry:*—M. C. Boswell.
Department 6, III Year; 85 hours.
A laboratory course in organic preparations in the aromatic series.

107. *Electrochemistry:*—W. L. Miller.
Departments 6, 7 and 8, III Year; Department 2, IV Year; 2 hours per week, first term.
A lecture course on elementary electrochemistry, illustrated by experiments.

108. *Electrochemistry:*—W. L. Miller and J. T. Burt-Gerrans.
Departments 6, 7 and 8, III Year; 3 hours per week, first term.
Department 2, IV Year.
A laboratory course in quantitative measurements to accompany Course 107.

109. *Inorganic Chemistry:*—J. W. Bain.
Department 6, IV Year; 2 hours per week, both terms.
A lecture course on chemical theory.

110. *Organic Chemistry:*—M. C. Boswell.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on advanced organic chemistry.

111. *Organic Chemistry:*—M. C. Boswell.
Department 6, IV Year.
A laboratory course in advanced organic chemistry.

112. *Industrial Chemistry:*—J. W. Bain.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on selected subjects in chemical technology.

113. *Industrial Chemistry:*—J. W. Bain, E. G. R. Ardagh, M. C. Boswell
Department 6, IV Year.
A laboratory course in industrial problems.

114. *Electrochemistry:*—J. T. Burt-Gerrans.
Department 6, 7 and 8, IV Year; 2 hours per week, both terms.
An advanced lecture course on the theory of solutions and electrolysis, and the application to the practice of electro-deposition and electrolytic refining of metals. The course also includes lectures on the electric furnace with special consideration of efficiency.
Text books:—Electrometallurgy—Borchers; Electrochemistry—Le Blanc; Electrochemistry—Luepke; The Electric Furnace—Stansfield.

115. *Electrochemistry:*—W. L. Miller and J. T. Burt-Gerrans.
Departments 6, 7 and 8, IV Year.
A laboratory course accompanying Course 114.

116. *Sanitary and Forensic Chemistry:*—J. W. Bain.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on the composition and examination of air, water and food; poisons and their detection, with accompanying laboratory course.

117. *Sanitary Chemistry:*—E. G. R. Ardagh.
Department 1_b, IV Year.
A lecture and laboratory course on water supply, sewage disposal, ventilation, etc.

ECONOMICS AND BUSINESS ADMINISTRATION

121. *Business:*—W. S. Ferguson.
Departments 1, 2, 3, 6, 7, 8, I Year; 1 hour per week, second term.
A lecture course on the principles underlying accounting and general business methods of a simple nature in order to enable the student to understand simple financial reports.

122. *Technical English:*—S. G. Bennett.
(*a*) All Departments, I Year; 1 hour per week, both terms.
A lecture course on the expression of ideas and the compilation and writing of different types of engineering reports; technical exposition; the derivation and use of technical terms; the necessity of accurate expression in professional writing; terminology; the use of graphic methods for presenting facts; abbreviations; numbers; symbols.
(*b*) Department 4, II Year; 1 hour per week, both terms.
This course of lectures includes a discourse on the literature which refers either directly or indirectly to architecture and the arts. Books are reviewed and discussed in round-table talks and essays prepared for practice in expression. The preparation of specifications and contracts for the execution of construction is continued from the course in the first year, specializing in architectural types.

123. *Economics and Finance:*—C. R. Fay.
All Departments, II Year; 1 hour per week, both terms.
An introduction to the study of Economics. The course will deal in an elementary fashion with the following:
(1) Scope and Method of Economics.
(2) Theory of Value and Distribution.
(3) Structure of Industry and Social Conditions.
(4) Money, Banking and Public Finance.
Text Book:—Economics for the General Reader—Clay.

124. *Commercial Law:*—A. R. Clute.
All departments, III Year; 1 hour per week, both terms. General Principles of the Law of Contracts, Principal and Agent, Partnership and Limited Companies (with special reference to the Companies Acts). General view of the following:—Negotiable Instruments, Sale of Goods, Bills of Sale and Chattel Mortgages, Suretyship and Guarantee.
Text-Book:—Stephens' Elements of Mercantile Law (6th Edition.)

125. *Engineering Economics:*—C. R. Young.
Departments 1, 2, 3, 7, 8, IV Year; 1 hour per week, second term.
A series of lectures on the principles by which the economic practicability of a project is judged and the comparison of competing proposals is made. Consideration is given to first cost and annual cost, methods of estimating, fixed charges and operating expenses, valuation and appraisals. Special attention is given to depreciation and the methods of providing for it, as well as to its relation to amortization. Typical numerical problems are discussed and solved.
Text Books:—Engineering Economies—Fish; Financial Engineering —Goldman.

126. *Engineering Law:*—R. E. Laidlaw.
Department 1, IV Year; 1 hour per week, first term.
A course of lectures, co-ordinating Engineering practice and Law as contained in various legislation such as: The Railway Act, Municipal Act, Public Health Act, Arbitration Act, Workmen's Compensation Act, Patents, Copyrights, etc.

127. *Contracts and Specifications:*—C. R. Young.
Departments 1, 4, 8, IV Year; 1 hour per week, second term.
This course of lectures deals with the fundamental principles of contract and specification writing. The critical examination of typical specifications and agreements by the class, forms an essential feature of the instruction.
Text Books:—Engineering Contracts and Specifications—Johnson; Elements of Specification Writing—Kirby.

128. *Management:*—C. R. Young.
Department 1, IV Year; 1 hour per week, first term.
A series of lectures dealing with the fundamental principles upon which management is based. The possibilities of effective management are indicated and its basis is shown to exist in suitable organization, adequate equipment and smooth administration. Consideration is given to such matters as selection of personnel, essentials of effective organization for enterprises of widely different character and the art of directing a force so as to attain a desired end in an expeditious and effective manner.
Text Books:—Construction Cost Keeping and Management—Gillette and Dana; Principles of Industrial Organization—Kimball; Administration of Industrial Enterprises—Jones.

129. *Plant Management:*—G. A. Guess.
Department 8, IV Year; 1 hour per week, first term.
A course of twelve lectures dealing with some phases of labour, plant organization, smelter contracts and markets.

130. *Industrial Management:*—E. A. Allcut.
Departments 3 (Option c), 6 and 7, IV Year; 1 lecture per week, both terms.
This course includes a study of industrial organization, location, arrangement, construction and equipment of industrial plants for efficiency and economy, process routing, scheduling work, reports, methods of superintending, employment, systems of compensating labour and systems of distributing indirect expenses.

131. *Railway Economics:*—W. M. Treadgold.
Department 1, Option e, IV Year; 2 hours per week, both terms.
The object of this course is to make the student acquainted with the general principle of railroad engineering and the following branches of the subject will be discussed—economic theory of location, train resistance, effect of grade, distance and curvature, rise and fall, maintenance of way, yards and terminals, tunnels and street railway practice.

132. *Municipal Administration:*—P. Gillespie, A. T. Laing.
Department 1, Option b, IV Year; 1 hour per week, both terms.
A course of lectures dealing with civics, local improvement laws and assessments, building codes, fire control, transportation, public utilities, etc.

133. *Public Speaking:*—W. H. Greaves.
Department 1, III Year; 1 hour per week, first term.
A course on the principles of public speaking and the means of expression accompanied by practical application and training in actual speaking.

ELECTRICITY

135. *Electricity:*—H. W. Price.

Departments 1, 2, 3, 6, 7 and 8, I Year; 2 hours per week, both terms.

A course of lectures on basic principles relating to electric circuits, magnetic circuits, instruments and apparatus in general, distribution of electrical energy, etc., illustrated largely from commercial apparatus. The point of view of this work is quantitative rather than descriptive, for it is believed that men who can solve engineering problems are most likely to grasp underlying principles.

136. *Electricity:*—W. S. Guest.

Departments 3, 6, 7 and 8, II Year; 2 hours per week, both terms.

Deals with the theory of electrical measurements, and detailed study of various methods applicable under different conditions in engineering practice to the measurement of resistance, current, potential difference, power and energy; calibration of commercial measuring instruments. The effect of choice of conditions of measurement on the accuracy of the result is considered.

137. *Electrical Laboratory:*—W. S. Guest.

Departments 3, 6, 7 and 8, II Year; 3 hours per week, both terms.

This laboratory course is closely associated with the lecture course 136 on electricity for the second year. The more important and useful methods of testing generators and circuits for electromotive force, resistance, current, grounds, etc., are practiced, often under conditions such as occur in practice. The work also includes methods of calibration of measuring instruments for voltage, current, power and energy, and certain studies of properties of incandescent lamps.

138. *Magnetism and Electricity:*—A. R. Zimmer.

Department 3, III Year; 2 hours per week, first term.

Department 7, III Year; 2 hours per week, first term; 1 hour per week, second term.

A course of lectures on theory of magnetism and magnetic circuits, theory of direct-current generators, motors, etc.

139. *Alternating Current:*—A. R. Zimmer.

Department 3, III Year; 1 hour per week, both terms.

Department 7, III Year; 1 hour per week, first term; 2 hours per week, second term.

A first course of lectures on alternating current, covering principles of measurement and leading to the analytical and graphical treatment of the simpler problems relative to alternating-current circuits and machinery.

140. *Electrical Laboratory:*—A. R. Zimmer.

Department 3, III Year; 3 hours per week; Department 7, III Year; 6 hours per week.

This laboratory course is intended to afford the student an opportunity to become familiar with principles involved in continuous-current shunt, series and compound-wound generators and motors, and, to some extent, alternating-current circuits and machinery. Other sections of the work deal with the magnetic properties of iron and steel, and study of iron losses in transformers and generators.

The course is arranged to stand in close relation to the lecture courses in the subjects of magnetism and electricity and alternating current (138, 139) for III Year, and to certain design work (141).

141. *Electrical Design:*—H. W. Price.

Department 7, III Year; 1 hour per week.

A course of lectures dealing with design of electrical apparatus and machinery, accompanied by designs to be worked out in the design room.

142. *Electrical Design:*—H. W. Price.

Department 7, III Year; 3 hours per week

A design room is set apart for working out designs of electrical apparatus such as transformers, generators, motors, auxiliary apparatus, etc.

Special forms and notes are employed, arranged to suit the various studies. Certain models are provided to assist where necessary.

143. *Electricity:*—H. W. Price.

Departments 1, 2 and 8, III Year; 1 hour per week, both terms.

A continuation of Course 135, First Year, adapted to the requirements of non-electrical students. It deals with problems on direct-current circuits and apparatus; magnetic circuits; power measurements; alternating current principles and machinery; transmission; power-plants, etc.

144. *Electrical Laboratory:*—H. W. Price, A. R. Zimmer.

(*a*) Department 1.
III Year; 3 hours per week, first term.
IV Year; Options d and e, 3 hours per week, second term.

(*b*) Department 2.
IV Year; 3 hours per week, first term.

(*c*) Department 3.
IV Year; 3 hours per week, second term.

(*d*) Department 6.
III Year; 3 hours per week, first term.

(*e*) Department 8.
III Year; 3 hours per week, both terms.

These courses are arranged to suit the requirements of the departments concerned. The experiments are planned with the idea of affording a general knowledge of circuits, power measurements, direct-current and alternating-current machinery and transmission of power.

145. *Applied Electricity:*—(*a*) Symbolic and Graphical Methods,
(*b*) Wave Form and Transmission Line—T. R. Rosebrugh.

Department 7, IV Year; 2 hours per week.

(*a*) Complex quantities and their use in a.c. problems. Loci for current and voltage vectors for given limitations on circuit constants. Short line distribution circuit loci; approximate graphical theory of synchronous motor.

(*b*) Non-sinusoidal alternating current waves, analysis of waves, forms of symmetry, three phase limitations, elimination of undesired harmonics, heating of rotary converters from combined a.c. and commutated d.c. waves, power, current, and voltage readings as influenced by wave form.

Long distance transmission line; principles and calculation. Unequal lines in tandem and in parallel.

Applied Electricity, (*c*) A.C. Machinery and Measurements:—H. W. Price.

Department 7, IV Year; 2 hours per week.

Polyphase alternating-current measurements of power, reactive power, apparent power, finding the indications of meters from given wiring diagrams, constructing wiring diagrams to obtain required meter indications. Potential and current transformers. Meter indications with distorted wave forms. Power transformers. Properties of alternators; induction motors of squirrel cage and wound-rotor types; synchronous motors; regulators; current-limiting reactors; arresters; and other general apparatus.

146. *Electrical Laboratory:*—A. R. Zimmer.

Department 7, IV Year, in connection with 145; 20 hours per week.

This laboratory course involves a thorough study of principles and properties of single and polyphase circuits and apparatus. Both vector and analytical methods are applied to the solution of problems based on tests made on laboratory machines.

The work deals mainly with constant-voltage and constant-current transformers, single and polyphase alternators, synchronous motors, rotary converters, induction and single phase commutating motors, transmission line, etc. The work does not consist only of factory tests, but is designed to lead the student to apply theory to practice as illustrated in the apparatus under test, with a view to an exact understanding of methods and an appreciation of limitations under many conditions. Free use is made of the oscillograph as a necessary device for "seeing" conditions under investigation. The best commercial measuring instruments are available.

147. *Radiotelegraphy:*—T. R. Rosebrugh.
Department 7. Option *r*, IV Year, in connection with 148; 2 hours per week.
Natural oscillations of simple and simply coupled circuits. Action of C.W. on circuits of the most general character. Radiation of antennas. Theory of modulation in radiotelephony. Energy control and transformation by vacuum tubes.

148. *Radiotelegraph Laboratory:*—W. C. C. Duncan.
Department 7. Option *r*, IV Year, in connection with 147; 9 hours per week.
The work in this laboratory covers the principles and the technique of measurements at radio frequencies. This includes measurements of wave length, resonance, coupled circuits, inductance, capacity, energy distribution, resistance, etc., at radio frequencies.
Considerable work is also done with the three electrode vacuum tube and its uses in radio and audio-frequency circuits.

ENGINEERING DRAWING AND DESCRIPTIVE GEOMETRY

160. *Descriptive Geometry:*—J. R. Cockburn.
Departments 1, 2, 3, 6, 7 and 8, I Year; 1 hour per week; both terms.
This course of lectures deals chiefly with the principles of orthographic and oblique projections and the application of such principles to the solutions of problems relating to straight lines and planes.

161. *Descriptive Geometry:*—J. R. Cockburn.
Department 4, I Year; 1 hour per week; both terms.
This course of lectures deals chiefly with the principles of orthographic and oblique projections and the application of such principles to the solution of problems relating to straight lines and planes, special reference being made to the determination of shades and shadows.

162. *Descriptive Geometry:*—J. R. Cockburn.
Departments 1, 2, 3 and 7, II Year; 1 hour per week, both terms.
This course of lectures is a continuation of the work taken in the first year with the following additions: Problems relating to curved surfaces, principles of shades, shadows and perspective.

163. *Descriptive Geometry:*—J. R. Cockburn.
Department 4, II Year; 1 hour per week, both terms.
This course of lectures is a continuation of the work taken in the First Year with the addition of problems relating to curved surfaces, shades, shadows and perspective.

164. *Descriptive Geometry:*—J. R. Cockburn.
Department 1, III Year; 1 hour per week, first term.
This course of lectures deals with spherical projections, the principles of mapmaking, and the graphical solution of spherical triangles.

165. *Descriptive Geometry:*—J. R. Cockburn.
Department 4, III Year; 1 hour per week, first term.
Advanced work in shades, shadows and perspective.

166. *Engineering Drawing:*—J. R. Cockburn.
Departments 1, 2, 3, 7 and 8, I Year; 11 hours per week, first term; 18 hours per week, second term.
Copying from the flat, lettering, topography; graphical solution of problems in statics; problems in descriptive geometry, relating to both orthographic and oblique projections; the plotting of original surveys; measured drawings.

167. *Engineering Drawing:*—J. R. Cockburn.
Department 4, I Year.
Lettering, the graphical solution of problems in statics; problems in descriptive geometry, relating to both orthographic and oblique projections; measured drawings.

168. *Engineering Drawing:*—J. R. Cockburn.
Department 6, I Year; 4 hours per week, both terms.
Copying from the flat, lettering, graphical solution of problems in statics, problems in descriptive geometry.

169. *Engineering Drawing:*—J. R. Cockburn.
Departments 1 and 2, II Year. Department 1, 4½ hours per week, first term; 13½ hours per week, second term. Department 2, 3 hours per week first term; 12 hours per week, second term.
Colouring and shading as applied to both topographical and construction drawings; problems in descriptive geometry relating to solids bounded by curved surfaces; principles of shades, shadows and perspective; solution of problems in optics and strength of materials; measured drawings; elementary design.

170. *Engineering Drawing:*—J. R. Cockburn.
Departments 3 and 7, II Year; Department 3, 13 hours per week, first term; 11 hours per week second term; Department 7, 12 hours per week, both terms.
Coloring and shading as applied to construction drawings; problems in descriptive geometry relating to solids bounded by curved surfaces; principles of shades, shadows and perspective; solution of problems in optics, theory of mechanism and strength of materials; measured drawings; elementary design.

171. *Engineering Drawing:*—J. R. Cockburn.
Department 4, II Year.
Principles of shades, shadows and perspective; problems in descriptive geometry relating to solids bound by curved surfaces; solution of problems in strength of materials.

172. *Engineering Drawing:*—J. R. Cockburn.
Department 6, II Years; 7 hours per week, first term; 3 hours per week, second term.
Department 8, II Year; 3 hours per week, first term; 6 hours per week, second term.
(Same as Department 3 with the exception that Dept. 6 has no descriptive geometry.)

173. *Engineering Drawing:*—J. R. Cockburn.
Department 1, III Year; 15 hours per week first term; 12 hours per week, second term.
Principles of mapmaking, spherical projection; problems in theory of construction; original design of various structures.

174. *Engineering Drawing:*—J. R. Cockburn.
Department 2, III Year; 9 hours per week, first term.
Problems in theory of construction; original design.

175. *Engineering Drawing:*—J. R. Cockburn, W. J. T. Wright.
Department 4, III Year.
Problems in shades, shadows and perspective.

177. *Engineering Drawing:*—J. R. Cockburn.
Departments 3, 6 and 8, III Year; Department 3, 9 hours per week, first term; Department 6, 6 hours per week, first term.
Problems in design dealing with the theory of structures.

178. *Structural Design Drawing:*—W. J. Smither.
Department 1, IV Year; 22 hours per week, both terms.
Problems in structural design.

179. *Structural Design Drawing:*—W. J. Smither.
Department 1*b*, IV Year; 5 hours per week, second term.
Department 1*d*, IV Year; 4 hours per week, first term; 8 hours per week, second term.
Department 1*e*, IV Year; 6 hours per week, both terms.
Problems in structural design.

180. *Structural Design Drawing:*—W. J. Smither.
Department 3, IV Year; 3 hours per week, both terms.
Problems in mill building design.

181. *Structural Design Drawing:*—W. J. Smither.
Department 3, IV Year, Option (b); 3 hours per week, both terms.
Problems in reinforced concrete design.

182. *Engineering Drawing:*—J. R. Cockburn.
Department 8, III Year; 3 hours per week, first term.
Plotting metallurgical flow sheets.

ENGINEERING PHYSICS

185. *Illuminating Engineering and Optics:*—G. R. Anderson.
Departments 1, 3, 6, 7, I Year.
Rectilinear propagation of light, illumination, photometry, light standards. Distribution of light by reflectors and diffusers, general and selective absorption, economic values of artificial lights. Illumination calculations.
Laws of reflection and refraction, theory of optical instruments.
Light considered as wave motion, dispersion, spectrum analysis, colour phenomena, polarization.
Lectures and laboratory work, both terms.

186. *Hydrostatics:*—G. R. Anderson.
Departments 1, 3, 6, 7, II Year.
Laws of fluid pressure and application to machines. Density of solids, and fluids, theory of flotation.
Lectures and laboratory work. Spring term.

187. *Heat:*—G. R. Anderson.
Departments 1, II Year.
Generation and propagation of heat. General and industrial thermometry, calorimetry and pyrometry. Linear and cubical expansion, gas laws. Specific heat of solids, liquids and gases, latent heat of fusion and vaporization. Mechanical equivalent of heat. Carnot cycle.
Lecture and laboratory work. Fall term.

188. *Photography:*—G. R. Anderson.
Department 1, II Year.
The camera and its adjustments, lenses, shutters, screens. Plates for various purposes, films, prevention of halation. Lighting, exposure, development. Paper of various kinds, printing, enlargement and reduction, blue printing and allied processes. Record photography, photogrammetry and photo-surveying. Photography in colour.
Lectures Fall term, and laboratory work both terms.

189. *Illumination:*—G. R. Anderson.
Department 4, II Year.
Principles of interior and street illumination. Artificial lighting of public and private buildings, etc.

190. *Acoustics:*—G. R. Anderson.
Department 4, III Year; Department 7, IV Year.
Wave motion, propagation, reflection and transmission of sounds. Laws of vibrating strings, pipes and forks. Velocity of sounds. Musical scales. Absorption of sound by various substances, use of deadening material in buildings. Amount of reverberation permissible and desirable in public buildings. Lectures and laboratory work.

191. *Photographic Surveying:*—G. R. Anderson.
Department 1a, IV Year; 1 hour lecture and 2 hours laboratory, first term.
This course presupposes a general knowledge of photographic processes as given in the second year. Treatment of a photograph as a perspective drawing from which plan and elevation to scale may be obtained under certain conditions. The intersection method of photographic surveying, its advantages and limitations. The stereoscopic method with its advantages and disadvantages. Method of plotting. Accuracy of results.

GEOLOGY

193. *Field Work:*—E. S. Moore.
Department 2, III Year; one week preceding the opening of the first term.

194. *Pleistocene Geology and Physiography:*—A. MacLean.
Department 2, IV Year; 1 hour per week, both terms.
Pleistocene Geology.—Lectures on the formation and distribution of the drift deposits of North America, with brief references to other regions. Glacial, Interglacial, and Postglacial beds are described, changes of climate are discussed with their probable causes, and the economic features of the clays, sands, and gravels are pointed out. A weekly excursion is made during October and November to points of interest near Toronto, which is the centre of the most important development of the Pleistocene in America.

Physiography.—A course of lectures on the surface forms of the earth, with the geological factors which have produced them. The broad features of the earth, its plains, tablelands, hills, valleys, mountains, oceans, rivers, and lakes are discussed in a general way; methods of topographical surveying and mapping are referred to, and the chief physiographic areas of Canada are described.

195. *Elementary Geology:*—W. A. Parks.
Departments 1, 2, II Year; 2 hours per week, second term.
This course deals chiefly with historical geology with special reference to Canadian formations.
Works of Reference:—Introduction to Geology—Scott; Elementary Geology—Coleman and Parks.

196. *Geology and Ore Deposits:*—A. MacLean.
Department 8, II Year; 2 hours per week, both terms.
Lectures and laboratory work on historical, structural, and economic geology, designed to familiarize the student with the more important principles, facts, and terms of general geology.
Works of Reference:—As in Course 195.

197. *Engineering Geology:*—A. MacLean.
Department 1, III Year; 1 hour per week, both terms.
This course deals with the application to engineering of dynamic, structural, and economic geology.
Works of Reference:—Engineering Geology—Ries and Watson.

198. *Dynamic and Structural Geology:*—A. MacLean.
Department 2, III Year; 1 hour per week, first term.
Lectures on geological forces and their effects. Particular attention is given to those aspects of the subject which apply in mining.

199. *Precambrian Geology:*—E. S. Moore.
Department 2, IV Year; 2 hours per week, first term.
Lectures on the Precambrian formations of Canada—their rocks, distribution, relationships, and economic features. Briefer accounts are given of similar formations in the United States and elsewhere.
Works of Reference:—Reports of the Geological Survey of Canada and of the Ontario Department of Mines; Reports of the United States Geological Survey.

200. *Mining Geology:*—E. S. Moore.
Department 2, IV Year; 2 hours per week, second term.
A course of lectures on geological problems associated with mining, typical mining regions in Canada, the United States, and elsewhere being discussed from the geological side.

Works of Reference:—Mineral Industry; Ore Deposits of United States and Canada—Kemp; and the works mentioned under Course 199.

201. *Geological Excursions:*—The Staff in Geology.
Department 2, IV Year.
During October and November weekly trips will be made to points of interest near Toronto.

202. *Economic Geology:*—E. S. Moore.
Department 2, III Year.
(*a*) *Ore Deposits:* 1 hour per week, both terms.
Discussion of the origin and classification of ore deposits, the mode of occurrence of the chief ores, and statistics of production. Special attention is given to the metals mined in Canada.
(*b*) *Economic Geology of the Non-metals:* 2 hours per week, second term.
Lectures on the origin and mode of occurrence of the valuable non-metallic substances—coal, oil, building stone, gypsum, cement materials, etc.
Works of Reference:—Economic Geology—Ries; General Economic Geology—Emmons; Ore Magmas—Spurr; Coal—Moore; Practical Oil Geology—Hager.

203. *Economic Geology:*—E. S. Moore.
Department 2, III Year; 2 hours per week, second term.
Laboratory work on ores, manner of occurrence, vein structure, etc., also the examination and construction of geological maps and sections of typical mining regions.

204. *Special Geology:*—A. MacLean.
Department 1, Option e, IV Year; 1 hour lecture and 1½ hour laboratory work per week, second term.
A lecture and laboratory course on superficial geology, physiographic control, water geology, etc.
Works of Reference:—Political and Commercial Geology—J. E. Spurr.

HYDRAULICS

205. *Hydraulics:*—R. W. Angus.
Departments 1, 2, 3, 6, 7, III Year; 2 hours per week, both terms.
This is a course of lectures in hydraulics devoted to the development and discussion of formulae relating to the flow of water in pipes, the measurement of discharge by various methods, such as orifices and weirs, the conditions of flow obtaining in open channels, artificial and natural, and in pipes flowing partially full, together with other kindred subjects.

The object of this course is to provide the student with a good working knowledge of the fundamental principle of hydraulics, such as is useful in practical work, and is necessary to the intelligent investigation of more advanced problems, such as the design of water supply, sewerage and irrigation system, and water power plants.

206. *Hydraulic Laboratory:*—R. W. Angus, R. Taylor.

Departments 1, 3, III Year; one 3 hour period per week, second term.

Departments 6, 7, III Year; 4 periods of 3 hours each.

The work in this course is intended to illustrate the lecture course given in hydraulics and to give the student some working acquaintance with the formulae met with in practice. Experiments are made to determine the coefficients for orifices of the various types used in practice and for a weir. The results of these experiments are used in measuring the discharge in subsequent experiments on meters and for the determination of hydraulic resistances in various cases of flow in pipes. The complete course illustrates very fully the application of the course of lectures to actual cases.

207. *Hydraulics:*—R. W. Angus.

Departments 1, 3, 7, IV Year; 1 lecture per week, both terms.

A course of lectures dealing with the various problems of unsteady flow such as occurs in power lines, penstocks, etc. Much of the work is done by the process of arithmetic integration, and the lecture work is supplemented by problems solved by the students in the work rooms, the time for which is included in course 209. Surges, water hammer, stream flow data, etc., are discussed.

The problems of collection of water for power purposes, use of the mass curve, rainfall and evaporation, turbine governing, etc., are also treated.

208. *Hydraulics:*—R. W. Angus.

Departments 1, 3, 7, IV Year; 2 lectures per week, both terms.

The most important question considered and to which most of the lectures are devoted is the theory of turbines and centrifugal pumps, the effect of the design on the speed, discharge and efficiency being fully taken up. The course includes the selection of turbines and pumps for given service intakes, draft tubes and all matters connected with hydraulic power plants.

Text Book:—Water Power Engineering—Mead.

209. *Hydraulics:*—R. W. Angus, R. Taylor.

Departments 1, 3, 7, IV Year; about 10 hours per week in 3 hour periods, both terms; Department 3, Option (c), first term only.

A laboratory course devoted to experimental work on turbines of various types and centrifugal and turbine pumps and other similar devices. This experimental work is arranged to illustrate the lectures on turbine and pump design. The experiments are made on two large turbine pumps used in the laboratory supply, as well as on apparatus specially designed for instruction. Various methods of measuring water-power and the efficiency of machines are also given. A list of the equipment now available, and which is used in this course, is given at the end of the Calendar.

210. *Hydraulic Laboratory:*—R. Taylor.
Departments 2, 8, IV Year; 3 hours per week, second term.
A laboratory course of experiments on orifices, weirs and meters.

211. *Hydraulics:*—R. Taylor.
Department 1_b, 1_e, IV Year; one hour lecture per week, first term.
A laboratory course of 3 hours per week, first term, on measurement of water, flow in open channels and on pumps.

212. *Hydraulics:*—R. Taylor.
Department 3, IV Year, Option (c); one hour lecture per week, both terms.
A lecture course on pumps and other hydraulic machinery.

HEAT ENGINES

216. *Steam Engines:*—E. A. Allcut.
Departments 3 and 7, II Year; 1 lecture per week, both terms.
Departments 2 and 8, II Year; 1 lecture per week, first term.
This course of lectures includes a discussion of the history and development of the steam engine and the functioning of its various component parts. Special attention is given to the theory and design of valves and valve operating mechanisms.

217. *Thermodynamics:*—E. A. Allcut.
Departments 3, 6 and 7, III Year; 2 lectures per week, both terms.
In this lecture course the laws of heat are used to develop the characteristic equation for a perfect gas and the use of thermal lines on the pressure-volume diagram. The properties of Carnot's cycle are then considered, followed by application of these principles to the hot-air engine, internal combustion engine and air compressor. A consideration of the properties of vapours and their application to the steam engine cycle concludes the course.

218. *Heat Engines:*—E. A. Allcut.
Department 3, III Year; 2 lectures per week, both terms.
Departments 7 and 8, III Year; 1 lecture per week, both terms.
The course in Heat Engines is intended to supplement the general lecture course in Thermodynamics by showing the practical

applications of the laws discussed therein. A general consideration of the laws of combustion and heat transmission is followed by their application to boiler practice. Details of steam, gas and oil engines are described and the lectures are arranged as far as possible to supplement the information obtained in the laboratory course 219.

219. *Thermodynamics and Mechanical Laboratory:*—R. W. Angus, E. A. Allcut, H. A. Tuttle.

Department 3, III Year; one 3 hour period per week, both terms.

Department 7, III Year; 2 hours per week, first term; 1½ hours per week, second term. Time to be in three-hour periods.

This laboratory course is designed to assist in a clearer understanding of thermodynamics, machine design and mechanics of machinery. The work in thermodynamics consists in the setting of slide valves, indicating engines measuring the brake horse-power, simple engine and boiler tests and the testing of gas and gasoline engines under various conditions. The mechanical laboratory work deals with the efficiency of belts as well as of several machines of simple construction. An examination of lubricating oils is also made by means of well-known methods. Experiments are also made on the balancing of reciprocating and rotating masses.

220. *Thermodynamics:*—E. A. Allcut.

Departments 3 and 7, IV Year; 2 lectures per week, both terms.

This is a continuation of course 217, the general thermodynamic theory being studied from the conception of the thermodynamic surface. The theory of the flow of gases and vapours through orifices, nozzles and pipes is then discussed and its application to the various forms of turbines is outlined. Following this, the principles of refrigeration, binary fluid engines and internal combustion are dealt with.

221. *Heat Engines:*—E. A. Allcut.

Departments 3 and 7, IV Year; 1 lecture per week, both terms.

This course is a continuation of the lectures on heat engines given in the Third Year, with special application to the steam power plant. The causes of the various losses occurring in steam engines and the considerations that influence them are studied in detail. Special attention is given to condensing plants, consumption records and other factors upon which the efficiency of a power plant depends.

222. *Thermodynamics:*—R. W. Angus, E. A. Allcut, H. A. Tuttle.

Departments 3 and 7, IV Year; about 9½ hours per week, in 3 hour periods.

The work in this year is a continuation and extension of the work covered in the third year laboratory course. Careful tests are made of engines of various types, such as simple, tandem and

cross-compound steam engines; steam turbine; refrigerating machine; injectors and steam pumps, etc.; and an application is made of Hirn's analysis and the entropy diagram to the results obtained. A complete set of experiments is made on each machine and the result plotted so as to show clearly to the student the effect of various alterations in the adjustment of the engine on the resulting efficiency.

Several modern gas and gasoline engines give ample opportunity for the study of this type of engine, and facilities are provided for sampling the gas supply and exhaust.

Two experimental stacks and three boilers enable results to be obtained on boiler efficiency and chimney draft.

223. *Thermodynamics:*—E. A. Allcut.

Department 1, III Year; 1 lecture per week, both terms.

Departments 2 and 8, IV Year; 1 lecture per week, both terms.

The general principles of thermodynamics, the properties of a perfect gas and their application to the Carnot cycle are first studied. This is followed by a consideration of the air compressor cycle, some details of air compressor operation and the theory of the flow of air through pipes and orifices. The properties of vapours and the principles of steam engine operation are also discussed.

224. *Thermodynamic Laboratory:*—H. A. Tuttle.

Departments 1 and 6, III Year; 7 three-hour periods; Departments 2 and 8, IV Year; 3 hours per week, first term.

A course of experiments with steam and gas engines, compressed air, etc.

225. *Motive Power:*—R. W. Angus.

Department 1, Option e, IV Year; one hour per week, both terms.

A course of lectures covering boiler capacity, locomotive horse-power, tractive effort, etc., necessary to carry specified trains over different conditions of roadbed.

226. *Heating and Ventilation:*—H. A. Tuttle.

Department 3, IV Year; Option (*c*); one hour per week, both terms.

This course is designed to give a working acquaintance with the essential engineering principles underlying the practice of heating and ventilation work.

227. *Refrigeration:*—H. A. Tuttle.

Department 3, IV Year; Option (*c*); one hour per week, both terms.

A course covering the principles underlying mechanical refrigeration, physical properties of different refrigerants, and a study of the various standard types of refrigerating machines and systems.

228. *Thermodynamics Laboratory:*—H. A. Tuttle.

Department 3, IV Year, Option (*c*); three hours per week, both terms.

A laboratory course on heating, ventilation, refrigeration, etc.

MACHINERY

230. *Theory of Mechanism:*—J. H. Parkin.

Departments 2, 3 and 7, II Year; lectures 2 hours per week; problems $1\frac{1}{2}$ hours per week, both terms.

This course of lectures treats of the elementary construction of machines and of the motions of the various parts. Methods of determining linear and angular velocities, methods for the solution of elementary problems involving forces and methods for the determination of the mechanical efficiency of machines are discussed. Velocity diagrams, crank effort and torque diagrams are plotted. Cams, toothed gearing and various types and applications of trains of gearing are considered.

Applications of the methods described are made to various machines including engines, machine tools, link motions, etc., and the lecture work is followed up by the solution of numerous examples in the drafting room.

Text Book:—Theory of Machines—Angus.

231. *Mechanics of Machinery:*—J. H. Parkin.

Departments 3 and 7, III Year; 1 hour per work, both terms.

This course is devoted to a consideration of the speed regulation and balancing of machines, and comprises lectures on the theory of various forms of governors, kinetic energy of machines and determination of speed fluctuations, the proper weight of fly-wheel, acceleration and inertia effects, and balancing.

The methods of analysis employed are those developed in course 230.

Text Book:—Theory of Machines—Angus.

232. *Elementary Machine Design:*—J. H. Parkin.

Departments 3, 6 and 7, II Year; 1 hour per week, both terms.

This is a preparatory course intended to familiarize the student with the different shop methods and processes, casting, forging, machining, etc., used in the production of machine parts, to enable him to make proper provision in the design of such parts to facilitate their production.

In addition, the various standards, machine and pipe threads, tapers, pipe fittings, etc., are described and mechanical drafting room practice explained.

Tolerances, limits, fits and gauges are discussed.

The design of simple machine fastenings and parts is taken up and examples worked out in the drafting room.

233. *Machine Design:*—J. H. Parkin and W. G. McIntosh.

Departments 3 and 7, III Year; 2 lectures per week, both terms.

The design work averages 7 hours per week for Department 3, and 4 hours per week for Department 7, the periods to be of not less than 2 hours' duration.

The lectures in this course deal with the design of various machine elements, including shafting, bearings (journal, thrust, ball and roller), belts, pulleys, fly-wheels, clutches, springs, machine frames, etc.

The problems worked out in the drafting room are planned to include the design of all of the above and with a view to developing the student's judgment and sense of proportion in design.

Text Book:—Machine Design—Leutwiler.

234. *Machine Design:*—J. H. Parkin and W. G. McIntosh.

Department 6, IV Year; Department 8, III Year; 1 lecture per week, both terms.

The design work occupies 3 hours per week for the second term only.

The lectures in this course deal with the design of various machine elements, particularly those likely to be met with in Chemical and Metallurgical plants.

The problems worked out in the drafting room are designed to give the student training in the general lay-out of shafting and plant machinery, as well as in the design of simple parts for chemical and metallurgical apparatus.

Text Book:—Machine Design—Leutwiler.

235. *Advanced Machine Design:*—J. H. Parkin and W. G. McIntosh.

Department 3, IV Year; 2 lectures per week in the first term, 1 lecture per week in the second term.

The design work averages 6½ hours per week for Option (*a*), 6 hours per week for Option (*b*) and 7 hours per week for Option (*c*), the periods to be of not less than 2 hours' duration.

The work of this course is devoted to the design of complete machines with the object of giving the student practice not only in the design of various details, but also in working in the various elements into a machine of smooth and harmonious design. The machines chosen as examples for design involve as many new machine elements as possible in order to broaden the training of the student.

Text Book:—Machine Design—Leutwiler.

MATHEMATICS

236. *Calculus:*—M. A. Mackenzie and J. L. Synge.

All Departments, I Year; 2 hours per week, each term.

Treatment of limits with special reference to those pertaining to exponentials and logarithms. Derivation of the fundamental formulae of the differential and integral calculus, with early application to simple problems concerning graphs, areas, volumes, lengths, etc.

237. *Calculus:*—M. A. Mackenzie and J. L. Synge.
Departments 1, 3, 6 and 7, II Year; 1 hour per week, both terms.
Continuation of course 236. The elementary theory reviewed and extended. Special attention to applications with problems in Engineering mostly in view.

238. *Analytical Geometry:*—S. Beatty.
All Departments, I Year; 1 hour per week, first term, 2 hours perweek, second term.
The course in Elementary Analytical Geometry covers the more familiar propositions in connection with the straight line, circle, parabola, ellipse and hyperbola. The subject is treated so as to illustrate the general methods of analytical geometry.

239. *Trigonometry, Spherical:*—L. B. Stewart.
Department 1, II Year; 1 hour per week, first term.
A course of lectures includes the derivation of formulæ and their application to the solution of triangles and to practical problems.
Text Book:—Spherical Trigonometry—Todhunter and Leatham.

240. *Least Squares, Method of:*—L. B. Stewart.
Department 1, III Year; 1 hour per week, second term.
The course of lectures includes: The general principles of probability, the law of error, direct measurements of equal and different weights; mean square and probable errors; indirect measurements; conditioned observations; applications to empirical constants and formulæ, etc.
Text book:—Least Squares—Merriman.

METALLURGY

241. *Elementary Metallurgy:*—G. A. Guess.
Departments 1, 2, 3, 6 and 8, II Year; 1 hour per week, second term.
A course of about 12 lectures on furnace metallurgy and present practice, with special reference to iron and steel.

242. *Fuels and Combustion:*—G. A. Guess.
Department 8, II Year; 1 hour per week, both terms.
A lecture course dealing with fuels, their use, preparation, calorific value and combustion.

243. *Metallurgy:*—G. A. Guess.
Departments 2, 6, III Year; 1 hour per week, both terms.
Fuels, temperature of combustion, specific heat, conductivity and problems thereon; chimneys, furnaces, refractories, outline of furnace metallurgy and hydro-metallurgy.

244. *Physical Metallurgy:*—O. W. Ellis.
Departments 2, 3, 6 and 7, III Year; 2 hours per week, second term.
The physical properties and structure of iron and steel and the more common alloys.

245. *Metallurgy:*—G. A. Guess, J. E. Toomer.
Department 8, III Year; 2 hours per week, first term; 1 hour per week, second term.
A lecture course on General Metallurgy accompanied by 3 hours laboratory per week, first term, and 6 continuous hours per week second term.

246. *Physical Metallurgy:*—O. W. Ellis.
Department 8, III Year; 1 hour per week, both terms.
Changes of phase and of state, pyrometry, preparation of alloys, miscibility of metals, binary, ternary and complex alloys, the use of the microscope, with 3 hours laboratory per week, first term.

247. *Metallurgy:*—G. A. Guess, J. E. Toomer.
Departments 2 and 6, IV Year; 1 hour lecture per week, both terms; 6 continuous hours laboratory per week, second term.
General metallurgy and metallurgical problems.

248. *Metallurgy Problems:*—G. A. Guess, J. E. Toomer.
Department 8, IV Year; 2 hours lecture and 4 hours laboratory, both terms.
Metallurgical book-keeping, balance sheets, thermal balance sheets, methods and processes.

249. *Metallurgy:*—G. A. Guess.
Department 8, IV Year; 1 hour per week, both terms.
Critical reading and discussion of papers and articles, describing metallurgical processes or dealing with plant arrangement and construction. Metallurgical flow sheets of typical plants.

250. *Physical Metallurgy:*—O. W. Ellis.
Departments 6 and 8, IV Year; 1 hour lecture and 3 hours laboratory per week, both terms.

251. *Metallography:*—O. W. Ellis.
Department 2, IV Year.
A laboratory course of 3 hours per week, second term.

252. *Physical Metallurgy:*—O. W. Ellis.
Department 1, IV Year; 1 hour per week both terms.
The physical properties of metals and alloys used in Civil Engineering practice—specifications.

253. *Heat Treatment of Iron and Steel:*—O. W. Ellis.
Department 3, IV Year; 1 lecture per week, both terms.
Heat treatment of iron and steel, case carburizing, case hardening and malleableizing.

MINERALOGY

255. *Elementary Mineralogy:*—J. E. Thomson.
Department 2, I Year; 2 hours per week, first term.
After introducing the student to the chief chemical, physical, and crystallographic characteristics of minerals, the course becomes descriptive and deals with about one hundred of the minerals most important from the industrial or scientific point of view.
Text Book:—Study of Minerals and Rocks—Rogers.

256. *Mineralogy:*—J. E. Thomson.
Departments 6 and 8, I Year; 3 hours per week, one term.
Introduction to determination of minerals by inspection and physical tests.
Text Book:—Mineral Tables—Eakle.

257. *Primary Mineralogy:*—A. L. Parsons.
Department 1, II Year; 2 hours per week, first term.
A very brief introduction to the study of minerals and rocks.
Text books:—Study of Minerals and Rocks—Rogers; Hand-Book of Rocks—Kemp.

258. *Mineralogy:*—J. E. Thomson.
Department 2, I Year; 1 hour per week, first term; 3 hours per week, second term.
Determination of minerals by inspection and by means of physical tests; introduction to blow-pipe practice.
Text books:—Mineral Tables—Eakle; Determinative Mineralogy—Lewis.

259. *Mineralogy:*—A. L. Parsons, J. E. Thomson.
Department 1, II Year; 1 hour per week, first term; 2 hours per week, second term.
Determination of minerals by inspection and by means of physical tests; study of common rock types and their identification.
Text books:—Mineral Tables—Eakle; Handbook of Rocks—Kemp.

260. *Elementary Petrography:*—T. L. Walker.
Department 2, II Year; 1 hour per week.
A course of lectures and laboratory work introducing the student to the macroscopic study of rocks.
Text-books:—Handbook of Rocks—Kemp.

261. *Mineralogy:*—J. E. Thomson.
Department 2, II Year; 2 hours per week.
Determination of minerals by means of the blow-pipe and physical properties.
Text books:—Mineral Tables—Eakle; Determinative Mineralogy—Lewis.

262. *General Petrography:*—A. L. Parsons.
Department 2, III Year; 1 hour per week.
Study of the chief rock-forming minerals and of some phases of petrography not covered in the course of the previous year.
Text Books:—Minerals in Rock-Sections—Luquer; Petrology for Students—Harker.

263. *Petrography:*—T. L. Walker.
Department 2, III Year; 2 hours per week, both terms.
Study of the chief rock-forming minerals, of rocks in thin sections and in hand specimens.
Text books:—Petrology for Students—Harker; Minerals in Rock Sections—Luquer.

MODERN LANGUAGES

266. *French:*—J. H. Cameron, Miss J. C. Laing, L. A. Bibet.
Required in Department 4, I and II Years; 2 hours per week, both terms; III Year, 1 hour per week, both terms.
(*a*) Practice in translation of selected texts bearing on some phase of architectural study.
(*b*) A course in Conversation to encourage the student to acquire a speaking knowledge of the language.

267. *German:*—G. H. Needler, B. Fairley.
Required in Department 6, all years; 1 hour per week, both terms.
An elementary course intended to train the student in the translation of scientific journals and treatises.

268. *Spanish:*—M. A. Buchanan.
Departments 6*k*, IV Year; 8, II Year; 1 hour per week, both terms.
An introduction to Spanish grammar, pronunciation and practice in reading Engineering Spanish.

PHYSICAL TRAINING

269. *Physical Training:*—G. D. Porter, D. M. Barton.
Required in all departments, I and II Years, and optional in the III and IV Years. Students in the I and II Years must be medically examined at the beginning of the session and are directed to the form of physical work most suitable to their requirements.

Those classified as A1 may elect to take any form of competitive athletics during the season in which that form of sport is in progress.

Military training in the C.O.T.C. constitutes are option in Physical Training (see page 123).

SURVEYING

270. *Surveying:*—S. R. Crerar.

Departments 1, 2, 3, 7 and 8, I Year; 1 hour per week, both terms.

The lecture course includes the general principles; surveying with the chain, the compass and chain and the transit and chain, and level, the applications of trigonometry to inaccessible heights and distances; mensuration of surfaces, co-ordinate surveying, division of land, etc.

Text books:—Plane Surveying—Tracy; Theory and Practice of Surveying—Johnston and Smith; Elementary Surveying—Breed and Hosmer.

271. *Field Work:*—S. R. Crerar, J. W. Melson.

Departments 1, 2, 3, 7 and 8, I Year; 5 hours per week, first term.

This course comprises testing chains; practice in chaining; a complete survey of a piece of land with the chain and transit; keeping of field notes; the use of the transit and compass in surveying closed figures and traverse lines and in ranging straight lines; plotting by latitudes and departures, and otherwise computing areas. Instrumental work with level, including roadway improvement.

272. *Surveying:*—W. M. Treadgold, E. W. Banting.

Departments 1 and 2, II Year; 1 hour per week, both terms.

This course of lectures takes up in detail, simple, reverse and compound curves as applied to railroad surveying. It also includes stadia, plane table and photographic surveying as applied to topographic work, and the main features of mine and hydrographic surveying.

Text books:—Henck, Searles, Allen (Field books for Engineers) Theory and Practice of Surveying—Johnston and Smith; Surveying—Breed and Hosmer.

273. *Field Work:*—W. M. Treadgold, E. W. Banting.

Department 1, II Year; 9 hours per week, first term.

Department 2, II Year; 6 hours per week, first term.

This course of instruction embraces all adjustments of the transit and level, minor problems in triangulation and traversing—levelling and plane table practice.

274. *Surveying and Levelling:*—W. M. Treadgold.

Department 1, III Year; 1 hour per week, both terms.

This course of lectures takes up the work of the railroad engineer on construction, including profiles, cross sectioning, computation of volume of earthwork, overhaul, transition curves, laying out turnouts, frogs and switches, etc.

Also a discussion of trigonometric and barometric levelling.

Text books:—Field Engineering—Searles; Railroad Curves and Earthworks—Allen.

275. *Survey Camp:*—W. M. Treadgold, S. R. Crerar, E. W. Banting, J. W. Melson.

Departments 1 and 2, III Year.

This course includes:

(*a*) Secondary Triangulation and Base Line Measurements.

(*b*) Stadia, Plane Table and Boundary Traverses.

(*c*) Highway and Railway Location.

(*d*) Cross Sectioning and Computation of Earthwork.

(*e*) Stream Gauging and Discharge Measurements.

(*f*) Hydrographic Surveying.

(*g*) Photographic and Micrometer work.

(*h*) Stadia and Plane Table Topography.

(*i*) Mine Surveying.

(*j*) Observations for Time, Azimuth and Latitude. This work is taken at Gull Lake Camp. See page 32.

276. *Railroad Location and Design:*—W. M. Treadgold.

Department 1, Option "e," IV Year; 1 hour lecture per week, both terms; about 8 hours per week, both terms, in the drafting room.

This work will consist of an original survey for a railroad some one or two miles in length, the work to be carried out according to the most modern methods of location. Upon the completion of the field work, the complete survey will be plotted and a line adjusted to it. This will be staked out, profiles taken and the computation made of the earthwork and the preparation of overhaul diagram compiled for determination of haul and borrow. In the second term the design of track work, yards and practical problems will be taken up and special problems assigned.

ADDITIONAL FOURTH YEAR COURSES

280. *Sanitary Engineering:*—Peter Gillespie.
Department 1_b, IV Year; 1 hour lecture per week, both terms; 3 hours laboratory, first term; and 6 hours, second term.
Consideration is given to the problems of water supply, sewerage and sewage disposal as viewed by the engineer. Some practice in the design of works from assumed data is afforded. Excursions to places of interest are arranged from time to time.
Reference Books:—Public Water Supplies—Turneaure and Russell; American Sewerage Practice—Metcalf and Eddy, 3 vols.

281. *Highway Engineering:*—A. T. Laing.
Department 1_b, IV Year; 1 hour lecture and 3 hours laboratory per week, both terms.
This course of instruction deals with the design, construction and maintenance of public highways and street pavements, also with the properties of the materials employed. Accompanying the course of lectures is a laboratory course dealing with the various bituminous and non-bituminous materials of construction. Excursions to places of interest are arranged for during the fall term.

282. *Municipal Seminar:*—P. Gillespie, A. T. Laing.
Department 1_b, IV Year; 3 hours per week, both terms.
This time is devoted to reading, essay writing and discussion of problems relating to highways, transportation, town planning, sanitation and kindred subjects.

283. *Zymology:*—H. B. Speakman.
A study of the phenomena of fermentation and their industrial applications.

THESIS

285. *Thesis.*
Required in all Departments, IV Year, with the exception of Department 4, Architectural Design Option.
Each student is required to prepare a thesis of between six thousand and seven thousand words on a subject approved by Council. See circular of information.

OUTLINE OF VACATION WORK

286. *Construction Notes.*
II Year. Departments 1, 2, 3, 4, 6, 7.

The construction notes required consist of neat and complete dimensioned sketches in pencil of any structures, machines or plants which may be of interest. Any object chosen should be represented and dimensioned in such a manner that it could be completely constructed from the notes as the only available information. (See page 30.)

From students in Department 2, who have been actually engaged during the summer with Government or other approved geological survey parties, geological field notes will be accepted in lieu of construction notes.

287. *Vacation Work:*—C. H. C. Wright, H. H. Madill, E. R. Arthur.
Department 4, III Year.
Each student is required to submit a set of rendered measured drawings of existing buildings or portions of buildings, the building first to be approved by the head of the Department, who will also decide the number and size of the drawings to be made. The record of measurements must be preserved in a notebook which will be submitted with the final drawings.

288. *Vacation Work:*—C. H. C. Wright, C. W. Jefferys.
Department 4, IV Year.
Each student is required to submit a set of at least six outdoor sketches in water colour, pen and ink, or pencil. The minimum size for each sheet will be $9'' \times 12''$. Of these sketches, three will be of an architectural character.

SCHOOL OF ENGINEERING RESEARCH

A School of Engineering Research, within the Faculty of Applied Science and Engineering, was established in the Spring of 1917 at the suggestion of the late Dean Ellis.

The School is under the direct supervision of a Committee of Management composed of fifteen Members of the Faculty Council. To this Committee is entrusted the selection of researches to be undertaken under the auspices of the School, and the disposition of funds conducting them.

The School was organized chiefly for the training of graduates in methods of research, and for the carrying out of investigations. These latter may be problems relating to specific industries or raw materials and having a specific end in view, or general problems having to do with fundamental principles.

A number of research assistants are appointed annually in the various departments of the Faculty to carry on the work of research under direction of members of the staff. The facilities of the School are also open to graduates who desire to penetrate more deeply into particular phases of experimental work, or to undertake investigations either suggested by members of the staff or arising from their own work since graduation.

Address communications to the Secretary—Professor Maitland Boswell, Ph.D.

ADVANCED COURSE IN HYDRO-ELECTRIC POWER

In view of the importance of Hydro-Electric power in Canada, further facilities are offered to those graduates who wish to supplement the present extensive undergraduate courses bearing upon this subject. Graduate studies may be pursued by candidates for the Degree of Master of Applied Science as soon as desired after graduation.

To those returning after satisfactory experience in some approved phase of Hydro-Electric work, somewhat more specialized courses may be given than are possible with very recent graduates. The Engineering Alumni Association of the University has expressed its willingness and desire to assist such candidates in obtaining suitable employment to fit them for these courses of study, but such courses are available only to those with the proper undergraduate preparation.

Graduates who may wish to avail themselves of the arrangements proposed are advised to communicate with the Dean.

It should be noted that candidates for post-graduate degrees register with the Secretary of the School of Graduate Studies. For further particulars see Calendar of the School of Graduate Studies and page 106 of this Calendar."

MASTER OF APPLIED SCIENCE DEGREE
MASTER OF ARCHITECTURE DEGREE

1a. A candidate for the degree of M.A.Sc. shall hold the degree of B.A.Sc. of this University or a degree from some other University recognized as equivalent by the Council of the School of Graduate Studies.

1b. A candidate for the degree of Master of Architecture should hold the degree of Bachelor of Architecture or the degree of Bachelor of Applied Science in Architecture of this University or a degree from some other University recognized as equivalent by the Council of the School of Graduate Studies.

2. He shall register with the Secretary of the School of Graduate Studies at the beginning of the academic year.

3. Not later than November 1 of his academic year, he shall submit to the Secretary for acceptance by the School of Graduate Studies the title of his proposed thesis as approved by the department concerned.

4. Not later than April 30th of his academic year, he shall present evidence to the Council of the School of Graduate Studies that he has spent not less than one academic year of the department concerned as a student enrolled in one of the following departments on a course of study approved by the department:—Civil Engineering, Mining Engineering, Mechanical Engineering, Architecture, Chemical Engineering, Electrical Engineering, Metallurgical Engineering.

5. Not later than April 30th of his academic year, evidence that the candidate has satisfactorily met all the requirements of the department with regard to thesis and to such examinations as the department shall require, shall be forwarded to the Council of the School of Graduate of Studies through the sub-committee administering the regulations governing the degrees of M.A.Sc. and M.Arch.

PROFESSIONAL DEGREES

The attention of graduates is directed to the following regulations respecting professional degrees.

The following degrees have been established: Civil Engineer (C.E.), Mining Engineer (M.E.), Mechanical Engineer (M.E.), Electrical Engineer (E.E.), Chemical Engineer (Chem.E.), Metallurgical Engineer (Met.E.), subject to the following regulations:

1. A candidate for one of the said degrees shall hold the diploma of the School of Practical Science or of the Faculty of Applied Science and Engineering or the degree of Bachelor of Applied Science.

2. He shall have spent at least three years after receiving the diploma or the degree in the actual practice of the branch of engineering wherein he is a candidate for a degree.

3. Intervals of non-employment or of employment in other branches of engineering shall not be included in the above three years. It shall not be necessary that the several periods requisite to make up the said three years be consecutive.

4. Satisfactory evidence shall be submitted to the University examiners as to the nature and length of the candidate's professional experience for the purpose of clauses 2 and 3.

   The Examiners may satisfy themselves by oral or written examinations in regard to the candidate's experience and competence.

5. The candidate shall prepare an original thesis on some engineering subject in the branch in which he wishes a degree, the said thesis to be accompanied by all necessary descriptions, details, drawings, bills of quantities, specifications and estimates.

The candidates may be required at the option of the Examiners to undergo an examination in the subject of this thesis.

6. Notice in writing shall be sent to the Secretary not later than the first day of November, informing him of the degree to which the candidate wishes to proceed and of the title of his proposed thesis for the approval of the Examiners.

7. The evidence under clause 4, and the thesis, with accompanying papers, described in clause 5, shall be sent to the Secretary not later than the first day of April.

8. The candidate shall be required to present himself for examination in the month of April at such time as may be arranged by the Examiners.

9. The fee for any one of the said degrees shall be twenty dollars, and shall be paid to the Bursar not later than the first day of April.

10. The thesis, drawings, and other papers submitted under clause 7 shall become the property of the University.

11. Nothing in this statute shall prevent any candidate from receiving more than one of the said degrees, provided he has the necessary qualifications for each degree. An interval of three years must elapse between the granting of any two degrees under this statute.

12. All communications must be addressed to the Secretary of the School of Graduate Studies.

CERTIFICATE FOR HIGH SCHOOL ASSISTANT

The Calendar of the Ontario College of Education provides for the admission of the holder of a degree in Science to the Course for a High School Assistant's certificate. The regulation requires that the applicant shall submit with his application:

"His certificate of graduation as Bachelor or Master of Arts, Bachelor or Master of Science, Bachelor of Commerce, Bachelor of Agriculture, or Bachelor of Applied Science, from a British University, after the regular university course approved by the Minister of Education as to entrance requirements and as to content of the undergraduate courses. Each applicant must have Upper School or Honour Matriculation standing in English and History and Mathematics or the equivalent of such standing."

LABORATORY EQUIPMENT

THERMODYNAMIC AND MECHANICAL LABORATORY

The University in 1919 completed the erection of a large, well-equipped building for the accommodation of the steam, gas, mechanical and hydraulic laboratories. A more complete description of the laboratories has been published elsewhere, so that the present description is only intended to give the main features.

The part of the building set apart for thermodynamics and other mechanical work is the ground floor of a room 60 ft. x 155 ft. This room is lighted entirely from the roof in a very perfect way. A part of the space 40 ft. wide running the entire length of 155 feet is served by a 3 ton travelling crane and contains the following equipment:

50 h.p. Brown engine with separate jackets on both heads and barrel of cylinder.

Two-stage Rand air compressor having compound steam cylinders, each fitted with Meyer cut-off gear. The low pressure air cylinder has Corliss inlet gear.

30 h.p. high-speed Leonard tandem compound engine with shaft governor.

15 h.p. high-speed McEwan engine.

75 h.p. two-line compound Willans engine.

25 h.p. General Electric steam turbine.

Two 15 h.p. Leonard engines with different types of valves, which are used for valve setting.

There are also two surface condensers with air pumps so arranged that any engine in the laboratory may be made to exhaust into the atmosphere through an open heater or into one of the condensers, the change from one arrangement to the other being accomplished in a few minutes without the aid of valves.

The laboratory further contains:

A 3 ton York refrigerating machine with tanks.

An Amsler transmission dynamometer.

Apparatus for testing injectors and steam pumps.

Numerous other pieces of apparatus and instruments.

The work on internal combustion engines and producers is performed on the following:

18 h.p. Canada suction gas producer.

14 h.p. National gas engine arranged for various compressions and points of ignition.

10 h.p. Fielding and Platt engine for city gas or coal oil, having various adjustments

8 h.p. Otto gas engine.

25 h.p. Allen semi-Diesel engine.

25 h.p. tractor gasoline engine.

200 h.p. Sprague electric dynamometer.

Various accessories to above machines.

Steam for the laboratory is supplied by two 50 h.p. and one 100 h.p. Babcock and Wilcox boilers, the latter having an internal superheater. These boilers are located in a separate boiler room. They are used for experimental work only and are fitted up for testing. The gases pass up through two independent chimneys, and these have been arranged so that the draft and other conditions in the chimney at any point of its height may be examined.

In smaller work-rooms off the main laboratory are placed belt and oil testing machines, apparatus for testing the efficiency of gears and machines, and for experiments in the balancing of machinery.

HYDRAULIC LABORATORY

The hydraulic laboratory occupies two floors each 40 feet x 112 feet, which are well lighted by large windows on the side and end.

The water for the experimental work is pumped through the various pieces of apparatus from a well by means of two turbine pumping units, both of which are driven by a Belliss and Morcom compound engine of 125 h.p. running at a speed of 525 revs. per minute. Both engine and pumps have been installed with a view to using them in experimental work as well as for supply of water for other apparatus used in the laboratory.

The pumping units are capable of delivering one cubic foot of water per second against heads of 250 feet and 300 feet respectively. These units are designed and connected up so that they may be run in series giving the above discharge at 550 feet head, or they may be run in parallel giving double the discharge at a lower head. Each pumping unit consists of two two-stage pumps mounted on a common base and driven by a single pulley, and the construction and piping are such that each two-stage pump may be driven separately or that all may be driven at once, discharging separately one cubic foot per second at about 125 feet head through each of four independent pipes, or else the pumps may be run in series or in parallel. The scheme is thus well adapted to laboratory work, and under the heads used on reaction turbines about six cubic feet per second may be obtained.

In addition to this there is an electrically driven pump capable of delivering six cubic feet per second at a head of sixty-five feet and which is most helpful in turbine testing. Attention is called to the special turbine testing flume described below.

The laboratory further contains a large vertical steel tank 5½ feet diameter by 34 feet with arrangements for the attachment of nozzles

and other mouthpieces, etc. Connections are also arranged for reaction turbines, the tank acting as a reservoir.

The discharge from the turbines or nozzles is measured in a weir tank nearly 6 feet wide and 21 feet long, containing a contracted weir 4½ feet wide. This weir may be calibrated by two weighing tanks, each having a capacity of about 240 cubic feet.

There are three reaction turbines and two impulse wheels all ready for experiment, the power being measured by brakes and the water by weir or orifices. Amongst the reaction turbines may be mentioned the one designed and built by Escher Wyss & Co., specially for the laboratory.

A new and specially designed turbine testing flume has recently been added to the laboratory, the machinery for which has been largely furnished through the kindness of the Dominion Engineering Works, Montreal, and Wm. Cramp and Sons, Philadelphia. This flume is supplied with water by a Moody spiral pump of twelve cubic feet per second capacity and at present there are two turbines, one of the propeller type, and also two special draft tubes and more will be added. This provides an excellent opportunity for experiment and research.

Smaller orifice and weir tanks, each about 3 x 3 x 12 feet with necessary measuring tanks, are arranged for instruction in coeficients of various kinds and practice with weirs and orifices.

A Venturi meter and other meters, also an hydraulic ram and similar devices are available for testing, and good facilities have been arranged for investigating friction and other properties of pipes and fire hose.

For special investigations on turbine and centrifugal pumps, other pumps in addition to those already described have been arranged.

The basement of the laboratory contains an open trough 5 feet wide, about 110 feet long, with a large weir at one end. It is intended to use this trough for experiments on the flow in open channels, for measurements of large discharges by means of the weir, and for experiments with current meters and Pitot tubes.

Numerous pieces of smaller apparatus, together with all instruments required, have also been provided, and the laboratory equipment is believed to be very complete.

AERODYNAMIC LABORATORY

The Aerodynamic Laboratory is located in a separate special building. The Laboratory is fully equipped with an improved 4-ft. Royal Aircraft Establishment type wind channel, aerodynamic balance, micromanometers and other necessary instruments.

Air speeds of 80 feet per second can be secured in a stream of great steadiness and uniformity and higher speeds with some sacrifice in steadiness.

The work done in the Laboratory includes the investigation of problems in aerodynamics, tests of air craft components, and complete machines, rating of meters, ventilators, radiators, etc., and the study of the effect of wind pressure on structures, chimneys, etc.

DONATIONS TO THE THERMODYNAMIC AND HYDRAULIC LABORATORIES

The following donations to the equipment of the laboratories have been made through the kindness of those mentioned:

50 h.p. Wheeler Surface Condenser, presented by Mr. F. M. Wheeler, New York.

Blake Feed Pump, presented by the manufacturers.

6-inch New American Turbine, presented by Wm. Kennedy & Sons, Owen Sound, Ont.

Two Crown Water Meters, presented by the National Meter Co., New York, through Mr. M. Warnock, Toronto.

Rock Drill, presented by Sullivan Machinery Co., New York, through Mr. A. E. Blackwood, '95.

Marine Gasoline Engine, presented by Canadian Fairbanks Co., Montreal.

Two engines with different types of valve, presented by Messrs. E. Leonard & Sons, London, Ont.

Bundy trap from American Radiator Co., through Messrs Russell & Gifford.

Dunham steam trap from C. A. Dunham Co.

Sectional models of valves from American Radiator Co.

Sectional model Mason Reducing Valve by Russell & Gifford.

Tanks, etc., by John Inglis Co.

Pressure Fan from Sheldons Ltd., Galt.

Model water turbine test runner from Wellman, Seaver Morgan Co., Cleveland, O.

Equipment for new turbine testing flume from Dominion Engineering Works, Montreal.

Multi-stage pump from Goldie and McCulloch, Galt.

Hytor vacuum pump complete with motor, etc., from Nash Engineering Co., Norwalk, Conn., through A. S. Leitch and Co., Toronto.

Model water turbine runners from Allis-Chalmers Co., Milwaukee.

Section of Trident water meter from Neptune Meter Co., Toronto.

In addition to the above, other firms have materially assisted by offering apparatus at or below cost price, among whom may be specially mentioned, The Canadian Rand Drill Co., Sherbrooke, Quebec.

The following machines are gifts from the Royal Air Force:

One S.E.5 Scout.

One Avro Training Biplane.

Liberty Aeroplane Motor 400 h.p.

200 B. h.p. Siddeley Deasey Aero Engine.

120 h.p. Beardmore Aero Engine.

Curtis Engine (Sectional).
Hispano Suiza Aero Engine.
80 h.p. Le Rhone Rotary Engine.
Clerget Rotary Engine.
Gnome Monosoupape Engine.
Admiralty Rotary Engine 150 h.p.
Models of Engines, etc., and numerous spare parts.

ENGINEERING PHYSICS LABORATORIES

Illuminating Engineering.

The laboratories for this work are equipped with 3 metre optical benches for instruction in the fundamental theory of optical instruments. There is also a general equipment consisting of one or more of the following: telescopes, field glasses, microscopes, spectrometers, sextants, range finders, polarizing instruments, etc. For work in illumination there is provided: a 3 metre precision photometer with integrating mirrors and rotator, integrating spheres, radial distribution photometer, portable illuminometers, spectro-photometer, gas light photometer, life racks, etc.

Hydrostatic Laboratory.

The Hydrostatic Laboratory is supplied with various types of hydrometers, hydrostatic balances, pumps, gauges, etc.

Heat Laboratory.

The Heat Laboratory is equipped with a full supply of colorimeters and accessories for determination of latent and specific heat, expansion apparatus, air thermometer, apparatus for verification of Boyle's law and pressure and boiling curve, and for determination of the absolute expansion of mercury, Callendar's apparatus for determination of the mechancial equivalent of heat. Calorimeter for the determination of the value of solid, liquid and gaseous fuels.

Acoustical Laboratory.

The Acoustical Laboratory is provided with sonometer, siren, forks ordinary and electric, Lissajous' and Melde's apparatus, organ pipes of various forms, manometric flame apparatus and a special equipment for work in architectural acoustics consisting of torsion chronograph, electro-pneumatic wind chest and standardized organ pipes and other accessories.

The following donations have been received for work in Illuminating Engineering, and are gratefully acknowledged:

Sample board of electric fittings from the Harvey-Hubbell Co., Toronto;
Sample board and easel, showing types of condulets, from the Crouse-Hinds Co., Toronto;
Demonstration sets to show construction of incandescent electric light bulbs, from the Canadian Sunbeam Lamp Co., Toronto;

Lamp rack illustrating various types of incandescent electric bulbs, from the Canadian Westinghouse Co., Hamilton;

Sample board illustrating types of industrial reflectors and elexit and other fittings, Benjamin Electric Co., Toronto.

Gasoline Mantle Lamps, Coleman Lamp Co., Toronto.

PHOTOGRAPHIC AND PROJECTION LABORATORIES

The Photographic Laboratory contains a supply of small cameras for the use of students, enlarging cameras, printers, blue printing machine and the necessary dark rooms.

This Department also carries on a photographic and projection service for all Faculties and Departments of the University. The equipment for this work consists of cameras for making photographs up to full plate size, enlargers, photo-micrographic apparatus, motion picture cameras for both gross and micro work, with the necessary developing and printing machines, a rotary blue print machine, a photostat, etc.

For projection service there is a motion picture projector and a number of projection lanterns for service in any University Building.

ELECTRICAL LABORATORIES

The Department of Electrical Engineering is located in the Electrical Building. The accommodation includes quarters for staff, library, lecture rooms, laboratories, stores, and shop for repairs and construction.

Services.—Three-wire direct-current, 110 kw., from the University power house, automatically regulated at our end for constant voltage of desired value at our main switchboard. Three-phase, 60 cycles, 60 k.v.a., 115 volts, automatically regulated as to voltage and frequency. Three-phase, 25 cycles, 30 k.v.a., automatically regulated as to voltage and frequency. Every laboratory has all three services available at convenient places. There are three main boards, one for each floor. A system of special trunk lines between boards, and tree systems on each floor, enable easy arrangement of any desired special connections from any laboratory to any other.

Alternating current laboratory.—Area 26 x 110 ft., service sets 60 and 25 cycles, Tirrill regulators. Two 60-cycle and two 25-cycle, 15 k.v.a. motor-generator sets; converters; various motors, squirrel cage and wound rotor induction types, repulsion and other single-phase types, unity power factor motor, polyphase motor with variable speed shunt characteristics and speed range of 4 to 1; transformers, single and three-phase; constant-current transformers with load of series arc lamps; lamp racks, reactors, condensers, brakes, etc.; oscillographs; indicating, graphic, recording, and demand meters of the best makes; all arranged to facilitate a very general line of experimental work.

Direct current laboratory.—40 kw. 230 to 115 volt motor generator set with Tirrill regulator for special tests. Numerous 5 kw. to 10 kw. motor-generator sets; shunt, series, compound motors; special interpole machines; loading racks, dynamometers, rheostats, numerous meters of first quality, etc., for any sort of study.

Measurements Laboratory.—26 x 110 ft. Fitted with very flexible storage battery service which can be connected to any desired working place; d.c. three-wire service, also 60 and 25-cycle three-phase everywhere; galvanometers, resistance boxes, bridges, shunts, potentiometers, standard cells, bond testers, ductor, megger, apparatus for measuring low resistances, artificial lines for fault measurements, condensers, inductances, rails, cables, voltmeters, ammeters, wattmeters, dynamometers, etc., for general work on a great variety of measurements.

High voltage laboratory.—For various lines of study with voltages up to 200,000 volts. Flexible and safe provision for control.

Materials laboratories.—One specially fitted for general work on conducting materials, one for magnetic materials, one for dielectric materials.

Radio laboratory.—Adapted for the measurement of various quantities of interest in this work, including the strength of incoming signals. One single conductor aerial 1,000 ft. long, one multi-conductor aerial 120 ft. long.

Standardizing laboratories.—One students' calibration room for direct-current meters, another for alternating-current meters. A standards room, constant temperature, for master standards of voltage, resistance, current, power, etc.

Research laboratories.—Four rooms set apart for this work, in combination with facilities of the other laboratories.

Design laboratory—Arranged for calculation work on apparatus selected to illustrate essential principles.

CHEMICAL LABORATORIES

The Chemical laboratories are situated in the western half of the Chemistry and Mining building, on the first and second floors. The rooms are large and well lighted, and are supplied with the usual modern equipment.

The first and second year laboratory for qualitative work has accommodation for 112 students, each working space being supplied with water gas and fume cupboard. The laboratory for quantitative analysis will accommodate 48 students, and is supplied with commodious fume cupboards and all necessary apparatus. A laboratory with working places for 36 is provided for the students engaged in the study of technical chemistry; it is equipped with appliances for the preparation and testing of chemical products. Laboratories for fourth year students with accommodation for twenty workers has been fitted up. Each of these laboratories has its own balance room adjoining furnished with instruments from the best makers and adapted to the particular objects in view.

In addition there are rooms set apart for research, for gas analysis, and a specially constructed fireproof laboratory for combustion, crucible and bomb furnaces. Each of these laboratories is supplied with apparatus of the most approved design, providing excellent facilities for the prosecution of work in analytical and technical chemistry.

A start has been made in equipping in a room in the basement, set apart for the purpose, as a laboratory for carrying on chemical operations on a small factory scale.

ELECTROCHEMICAL LABORATORIES

The Electrochemical laboratories, which are situated in the Chemistry and Mining building, are provided with special facilities for electrolytic work, including a large storage battery and electroplating dynamo with tanks as well as a good set of apparatus and electrical measuring instruments. The experimental work on electric furnaces is carried out in a large furnace room in the basement, occupied jointly by this Department and the Department of Metallurgy. The equipment for this purpose comprises a 120 KW, 110 volt generator supplying direct current through a switchboard, rheostats, circuit-breaker and instruments to a set of distributing bus-bars, and a 200 KV-a transformer stepping down from 2200 volts to 30-120 volts in 3 and 6 volt steps, which supplies alternating current at 25 cycles. There is a complete set of A.C. instruments, circuit-breakers, oil-switches, relays, automatic regulating winches, etc., and a Northrup high frequency furnace with its transformer is also installed.

ASSAYING LABORATORIES

These are situated in the west end of the basement in the Mining Building. They consist of five rooms, in addition to a library for study and an instructor's room. The East laboratory, 17 x 47 feet, and the West laboratory, 28 x 37 feet, are equipped with coal, oil, gas, and electric furnaces of various design. Each room has a fume cupboard, and the necessary equipment for the wet work in connection with assaying. Accommodation for twenty-four students at a time is provided, by individual work desks, each supplied with a balance, weights, fluxes, tools, drawers and lockers. Common to both laboratories is the balance room which has a cement table on brick piers to support the bead balances. These are illustrative of the types met in practice. Adjoining the West laboratory is a research room. A store-room adjoins the East laboratory where fluxes, clay ware and extra parts are kept. In the instructor's room are stored a large number of ores and bullion, obtained chiefly from typical mining districts and metallurgical plants, for class use. The preparation of ores is done in the Milling building, where crushers, pulverizers and sampling devices are available. A special laboratory sampler has been constructed for the purpose of giving samples for the student's assays, of indisputable

similarity, thus confining variations in results to the students' work. Other apparatus includes Guess-Haultain stationary electrolytic outfits, King rotating electrolytic apparatus, microscopes, optical resistance and thermocouple pyrometers, hand and foot cupel machines, grinding plates and screens.

MINING AND ORE DRESSING LABORATORY

A detached building 72 ft. x 70 ft. contains the Mining and Ore dressing equipment. It is heated, lighted and supplied with power from the central plant. It is divided into several parts, the larger being 72 ft x 53 ft. by 22 ft. high.

In this room is a 5-stamp battery with amalgamation plates, Wilfley table, Deister Plat-o table, Deister slime table, buddle, and classifiers of sufficient size to make tests on lots of from one to ten tons.

In addition are a set of small Wilfley tables, two 3-compartment jigs, a 2 ft. x 3 ft. tube mill, a small experimental tube mill, agitators, small classifiers and other testing apparatus for experimenting on the falling rates of ore particles, slime settling, surface tension and flotation processes. These include a Case machine, a K. and K. machine, a Ruth machine, a Callow cell, etc. Water is supplied from a tank in the roof. The machinery is all motor driven.

One portion of the room is devoted to rock drills of various types and other mining apparatus.

The other part of the building, 72 ft. x 17 ft., is divided into several rooms and contains a Hadfield's Gyratory Crusher, 16 in. x 12 in. Rolls, small crushers, screening machine, and sampling apparatus. The crushers are driven by a 30 h.p. motor in another room.

The other rooms contain a Wetherill magnetic separator, screen sets, a smithing equipment, workshop and storage for small lots of ore. The larger part of the ore supply is accommodated in bins outside the building.

The plant throughout is intended mainly for teaching and experimental purposes.

There has recently been added apparatus especially designed for research work in various phases of rock crushing and grinding:—Ball Mills with plate glass ends for the study of ball paths; a small Ball and Rod Mill on ball bearings with dynamometer; a set of high grade miniature Rolls in ball bearings with integrating dynamometer.

METALLURGICAL LABORATORIES

This laboratory, in the East end of the Mining building, occupies about 3,600 sq. ft. on the basement floor and the same space immediately above on the ground floor. The basement floor is divided into one large furnace room, a small hydrometallurgical room and two store-rooms. The furnace

room contains a motor driven Connersville blower, several gas fired furnaces, two small blast furnaces, and a small 6 hearth Wedge roasting furnace. The larger electric furnaces of the Department of Electrochemistry are in this room. Some are supplied with direct current, others with A.C. from a 200 K.V.A. transformer. A system of flues, with hoods over all the furnaces, leads through a Cottrell precipitator of the Rathbun type taking current at 50,000 volts, to a stack through which gases are pulled by a fan in the attic.

The hydro-metallurgical room in addition to apparatus for leaching tests contains several natural draft furnaces, a large Hoskins resistance furnace and a 113 lb. drop hammer. There are also tanks for electrolytic refining and precipitation of metals.

The upper floor is divided into laboratories, store rooms and offices. The laboratories are: 1. Metallurgical analysis; 2. Heating treatment and pyrometry; 3. Grinding, polishing and etching; 4. Metallographic room with an adjoining dark room.

In the laboratory for metallurgical analysis the student is given some training in mill and smelter methods of analysis. It is well equipped for this work.

In the heat treatment and pyrometry laboratory are a number of tube furnaces of different sizes, a Leeds & Northrup transformation point indicator with furnace, double thermocouple and twin galvanometer, a Leeds & Northrup potentiometer pyrometer, a disappearing filament pyrometer, and many thermocouples for use with galvanometer or potentiometer. For grinding and polishing there is provided two motor driven emery wheels and a set of 3 motor driven horizontal polishing plates.

The metallographic room is equipped with one horizontal photo micrographic instrument made by Pellin Paris, one vertical photo micrographic apparatus by Bausch & Lomb and two other Bausch & Lomb metallographic microscopes.

There are also a Pellin instrument for the determination of critical points by photography according to the Saladin method and a Leeds & Northrup type "K" precision potentiometer, which is also used for the determination of critical points.

MECHANICS OF MATERIALS LABORATORY

This laboratory is available for the scientific and commercial testing of materials of construction such as iron, steel, timber, concrete and masonry.

It is supplied with the following:

An Emery 50-ton hydraulic machine, built by Wm. Sellers & Co., of Philadelphia, for making tests in tension and compression.

A 100-ton screw power machine, built by Riehle Bros., Philadelphia. It is designed for making tests in tension, compression, shearing and cross-breaking, and will take in posts 12 feet long and beams up to 18 feet in length.

A Riehle 10-ton screw power universal testing machine.

A Riehle 50-ton screw power universal testing machine.

A Riehle 50-ton hydraulic testing machine intended especially for testing concrete blocks.

A Riehle standard brick rattler.

A 15-ton single lever-machine, built by J. Buckton & Co., Leeds, England.

A torsion machine, built by Tinius Olsen & Co., Philadelphia, for testing the strength and elasticity of shafting. This machine will twist shafts up to 16 feet in length and 2 inches in diameter.

A hand power torsion machine of simple mechanical construction, specially designed for the testing of short shafts of a maximum diameter of one inch.

A Riehle transverse testing machine of 5,000 pounds capacity, adapted to specimens up to 48 inches in length.

A Riehle compressometer, with spherical seat attachment for the adjustment of specimens having slightly non-parallel faces. This compressometer will receive specimens up to 10 inches in length.

An Olsen compression micrometer of standard type.

A 20,000 pound Olsen, hand power, wire testing machine, specially fitted for testing wooden columns with both fixed and pivoted ends.

An Olsen combined tension and cantilever type impact testing machine.

An Olsen, 20,000 pound, hand power testing machine especially adapted for testing long columns.

An Olsen, 200 pound capacity, textile testing machine.

A Riehle abrasion cylinder, built to the standard required by the National Brickmaker's Association, adopted in 1901.

A Berry strain-gauge for spans of 3 inches and 8 inches.

A Nalder dividing engine. This may be used either for the precise division of scales or for the calibration of instruments intended for refined measurements.

A Brinell hardness testing machine.

A Shore scleroscope for testing hardness.

A large number of extensometers of the usual degree of precision. These include the Bauschinger, Martens, Unwin, Ames, Riehle, Johnson, Henning (recording) and other types. In addition there are the usual scales, micrometers, telescopes and reflectors, voltmeters for the determination of metallic contact, and such other appliances as are necessary in the making of precise measurements.

The shop is equipped with a number of high-class machine tools specially fitted for reducing the specimens to the requisite shapes and dimensions with a minimum of hand labour. It is also supplied with the necessary appliances for making ordinary repairs and for making apparatus for special experiment and original investigation.

HIGHWAY LABORATORY

ROAD METALS

This laboratory is equipped for carrying out investigations in the various materials employed in highway construction and maintenance, and comprises the following:

Page impact machine for testing the toughness of road materials.

Diamond core drill for preparing specimens for the toughness test.

Deval abrasion machine for testing the resistance to wear of road materials.

Cementation testing apparatus (Page type) for determining cementing properties of road materials.

Jaw crusher (Mitchell type) for crushing rock for various tests.

Power driven agitator with sieves for the mechanical analysis of sand, gravel and crushed rock.

Dorry hardness testing machine for determining the hardness of rock used in road construction.

BITUMENS

This laboratory is designed for the investigation of the physical rather than the chemical properties of bitumens used in road construction and maintenance. The equipment consists of an extractor for separating bitumens and aggregates, an Engler viscosimeter, a penetration apparatus as well as appliances for determining melting point, volatilization, specific gravity, ductility, etc.

LABORATORY OF ONTARIO BOARD OF HEALTH

Through the courtesy of the Secretary of the Provincial Board of Health for Ontario the facilities of the excellently equipped laboratory which the Board maintains at Stanley Park have, with certain conditions, been placed at the service of the University for the investigation of problems of interest to the sanitarian and the sanitary engineer. The equipment consists of various types of sewage sedimentation tank, sewage filter, sewage measuring devices, aerators, sterilizing appliances and a complete and representative plant intended for the filtration and sterilization of water by practically all known methods.

CEMENT TESTING LABORATORY

This laboratory is fitted with all the ordinary moulds, sieves, balances burettes, steaming and drying tanks, tables, and other appliances necessary in making the usual physical tests of a Portland cement. It is also supplied with completely equipped cabinets for individual work. In addition there are the following:

A 2,000 lb. Riehle shot machine for tension.

A 2,000 lb. Fairbanks shot machine for tension.

A 1,000 lb. Olsen automatic shot machine fitted for tests in either tension or cross breaking.

An Olsen soapstone moist closet of modern design.

METROLOGICAL LABORATORY

The department of surveying and geodesy is provided with all the ordinary field instruments, such as transits, levels, compasses, micrometers, sextants, planimeters, plane tables, tapes, chains, etc., with which is carried on the instruction in practical field operations as detailed elsewhere.

A small laboratory is also established in the basement of the observatory described below, containing the necessary instruments for the refined measurements of geodetic surveying; as, a standard yard and metre, a Rogers 10-foot comparator, an invar base measuring apparatus, a Kater's pendulum with vacuum chamber, a level trier, micrometer microscopes, etc.

The geodetic observatory in connection with this department is used for the instruction of students of the Fourth Year in taking observations for time, latitude, longitude, and azimuth by the precise methods used in connection with a geodetic survey. It contains a 10-inch theodolite and zenith telescope by Troughton & Simms; an astronomical transit instrument and an 8-inch theodolite by Cooke; two electro-chronographs; a Howard astronomical clock; a Dent sidereal clock; a Dent sidereal break-circuit chronometer; a wireless receiving instrument; arithmometers, etc.

GEOLOGICAL AND MINERALOGICAL LABORATORIES

In the Chemistry and Mining building on College Street the University possesses a modern laboratory for Geology and Mineralogy.

Courses are given in laboratory work, especially in personal examination of type sets of rocks, fossils, minerals and crystal models. These laboratory exercises serve to illustrate the introductory didactic instruction.

For the encouragement of pure crystallography the laboratories are supplied with goniometers of the various types, crystal models, appliances for the cutting of oriented crystal sections and for the physical examination of the same. Practical petrography is carried on in rooms provided with type sets of rocks, both macroscopic and microscopic. Advanced students are taught to make thin sections of rocks and fossils and to study them microscopically. For students in Mining a laboratory course in the interpretation of geological maps and section is provided. Typical mining regions are studied in detail and an opportunity is afforded for the examination of specimens illustrating economic geology.

The laboratory for the preparation of thin sections of rocks, minerals and fossils is provided with electric diamond saws and grinding appliances for the various types of work incidental to the preparation of thin sections and museum material.

A room is also provided for advanced work in cartography and geological surveying.

The departments possess 28 petrological microscopes and 5 of other types, so that it is now possible to provide advanced students with instruments and sets of thin sections for their own especial use. The blowpipe laboratory contains 156 lockers, especially designed for apparatus for students. Provision is made for the study of opaque minerals in reflected light.

LIBRARY

The University Library is contained in a building of its own, situated on the east side of the campus, that lies to the south of the Main Building. All students who have paid a library fee to the Bursar of the University are entitled to the privileges of the Library. Besides Reading Rooms the Building contains Departmental Studies, which may be used as study-rooms by honour students in the various branches and in which the Professors hold seminary courses, and private studies, intended for members of the Faculty or advanced students engaged in research work. The Library is opened at 8.45 every morning and remains open until 10 at night during the academic term. Books in ordinary use may not be taken out of the building during the daytime, but are lent for the night towards 5 p.m., to be returned the following morning before 10 o'clock. Books not in general demand may, on special application, be borrowed for a longer period. Failure to return a borrowed book at the proper time and other breaches of the regulations are punishable by fine or suspension from the privileges of the Library.

Rooms have been set apart in the Engineering, Mechanical, Chemistry and Mining and Electrical buildings for the housing of such periodicals and other literature of the University Library as is of special interest to the students of this faculty.

ROYAL ONTARIO MUSEUM

ARCHAEOLOGY, GEOLOGY, MINERALOGY, PALAEONTOLOGY, ZOOLOGY

Students of the University in all departments are recommended to avail themselves of the privileges of the Museum, which, although under separate control, is intimately connected with the work of the University.

The Museum is open on all week days from 10 a.m. to 5 p.m., and on Sundays from 2 p.m. to 5 p.m. The admission is free to the public on Tuesday, Thursday, Saturday and Sunday. On other days an admission fee of fifteen cents is charged.

By a resolution of the Board of Trustees all regular students of the University may be admitted free on all days of the week by presenting their card of registration.

UNIVERSITY OF TORONTO C.O.T.C.

The Toronto Contingent of the Canadian Officers Training Corps was organized in 1914. Its primary object is to provide students at Universities with a standardized measure of military training with a view to their qualifying for commissions in the country's auxiliary forces. C.O.T.C. Certificates of qualification exempt their holders from examination for commissioned rank on joining a militia unit in Canada, or, if resident in the British Islands, render them eligible for commissions in the Army Reserve of Officers, the Militia, or the Territorial Army. Holders also obtain certain concessions and privileges on offering themselves as candidates for entry to Woolwich, Sandhurst and the Air Force College or for first appointments in the Navy, the Navy Medical Service, the Royal Marines and the Army Medical Corps. The facilities which are offered by the contingent for obtaining a qualification while at the University, are intended to enable young gentlemen to give personal service to their country with the least possible interference with their civil careers, to ensure that units have their establishments complete in the junior commissioned ranks, and to build up an adequate reserve of scientifically trained officers who have completed a period of consecutive and systematic military training, on academic lines, of a nature calculated to produce good officers.

The contingent provides the practical work for students taking the Military Studies option for the Arts degree, as also physical exercise for students who may choose this as the form in which they will take their compulsory Physical Training. In addition to service in the corps for a University credit, students of any year or Faculty are trained in it to qualify for officers' certificates in the Infantry, Engineers, and Army Medical Corps, writing on the examinations set by the War Office for members of O.T.C. contingents throughout the Empire.

There are at present three companies—in Arts, Medicine and Applied Science respectively—and the training of each is so arranged that on leaving the University students are qualified for commissions in that branch of the Militia to which their University course particularly applied.

The C.O.T.C. is a unit of the non-permanent Active Militia but forms no part of the organization for war and cannot be called out for active service as such. It is a training centre for the educated youth of the country from whom, as from all its sons, the Empire requires hard service, but the hardest from those to whom most has been given.

The present Headquarters are at 184 College Street, and include armouries, members' reading room, library, and lecture rooms.

The Contingent's Staff is:

Officer Commanding.........Colonel W. R. Lang, late Gen. Staff, C.E.F.
Second in Command.........Major T. R. Loudon, late Can. Eng., B.E.F
Adjutant..................
Quartermaster...............Capt. W. G. C. Kenney, late R.A.V.C., B.E.F.
Paymaster..................Capt. T. A. Reed
Contingent Sergeant-Major....S-M. W. Hunt, late Royal Welsh Fusiliers.

Officers of "C" (Applied Science) Company:

Officer Commanding..........Major J. R. Cockburn, M.C.
Second in Command..........Capt. W. J. T. Wright, M.B.E.
Subalterns..................Lieuts. F. J. Milne, H. Miller, H. G. G. Whitton, A. D. Morton.

SOCIETIES

THE ENGINEERING SOCIETY OF THE UNIVERSITY OF TORONTO

Officers for 1924-1925

President..J. F. Millican
First Vice-President..................................W. I. Turner
Second Vice-President...............................E. R. Complin
Treasurer..C. K. Lally
Secretary..R. B. Rochester
Curator..H. Vernon
Fourth Year President...............................J. W. Kennedy
Third Year President................................R. E. Smythe
Second Year President...............................W. H. M. Laughlin
First Year President................................J. C. Annesley
Civil Club Representative...........................A. J. Hill
Mining and Metallurgical Club Representative........W. R. Chowen
Mechanical and Electrical Representative............G. M. Crossgrove
Chemical Club Representative........................A. D. Morton
Debating Club Representative........................A. D. Turnbull
Athletic Association Representative.................A. W. Jeckell
Architectural Club Representative...................W. H. Steele

The Society meets every second Wednesday during the academic year (except April), beginning with the second Wednesday in October. Asdresses are given by prominent men on subjects of general interest.

The Society is divided into six clubs for the purpose of affording a medium of study of matters relating in particular to different branches of Engineering. Each of the Clubs holds its meetings at regular intervals. Papers are read and discussions held on engineering subjects.

The Society publishes an annual, called "Transactions," which contains the addresses given at the meetings and an account of the year's activities.

A Supply Department is conducted by the Society on a co-operative plan, through which instruments, draughting supplies, stationery, etc., can be purchased at a low cost.

ATHLETIC ASSOCIATION
1924-1925

Hon. President.....................................Prof. T. R. Loudon
President..A. W. Jeckell
Vice-President.....................................A. A. Somerville
Secretary-Treasurer................................C. A. Morrison
Fourth Year Representative.........................V. D'E. Strickland
Third Year Representative..........................C. A. Pollock
Second Year Representative.........................G. B. Smith
First Year Representative..........................D. J. McKenzie

The Athletic Association has full control over all athletic clubs using the name of the Faculty of Applied Science. The Executive Committee has power to suspend any one from the privileges of membership in the Association for any breach of its regulations, and controls the finances of all athletic clubs in the aforesaid Faculty. The annual membership fee of this Association is one dollar.

No other moneys are collected for the support of athletics in the Faculty of Applied Science without the sanction of the Executive Committee.

DEBATING CLUB

1924-1925

Hon. Chairman	Prof. Haultain
Chairman	A. D. Turnbull
Vice-Chairman	J. H. Ings
Secretary-Treasurer	E. T. W. Bailey
Fourth Year Representative	N. M. MacPherson
Third Year Representative	H. D. Griffith
Second Year Representative	G. L. Delaplante
First Year Representative	V. G. Loscombe

The Debating Club exists for the purpose of helping students to overcome their natural embarrassment when speaking in public and to that end holds weekly meetings during both terms, at which open debates take place after the manner of the Oxford Union.

THE INDUSTRIAL CHEMICAL CLUB

1924-1925

Hon. Chairman	Prof. J. W. Bain
Chairman	A. D. Morton
Vice-Chairman	J. D. Hawken
Secretary-Treasurer	W. M. Scarth
Curator	G. L. Andrew
Fourth Year Representative	R. S. Kerr
Third Year Representative	C. W. Witherell
Second Year Representative	R. E. Richardson
First Year Representative	C. F. Burk

The object of the Chemical Club is to promote the study of industrial chemistry and chemical engineering. Illustrated lectures, preceded by an informal dinner and a short musical programme, are held fortnightly, and on the following day an excursion is made to industrial concerns located in the city or vicinity.

MECHANICAL AND ELECTRICAL ENGINEERING CLUB
1924-1925

Hon. Chairman......................Prof. R. W. Angus
Hon. Vice-Chairmen....Asst. Prof. A. R. Zimmer, Asst. Prof. J. H. Parkin
Chairman..........................G. M. Crossgrove
Vice-Chairman (Mechanical)..........F. W. Watson
Vice-Chairman (Electrical)............A. H. Frampton
Secretary-Treasurer..................C. E. Nugent
Third Year Representative.............C. H. McGuire
Second Year Representatives...........J. E. Howell, J. K. Gardner
First Year Representatives.............H. T. Pritchard, J. H. P. Russell

The Club meets every Thursday during the academic year for the discussion of papers relating to mechanical and electrical engineering problems.

CIVIL ENGINEERING CLUB
1924-1925

Hon. Chairman............................Prof. P. Gillespie
Chairman...............................A. J. Hill
Vice-Chairman...........................W. H. Kribs
Secretary-Treasurer.......................W. L. Cooke
Fourth Year Representative................A. M. Toye
Third Year Representative.................D. C. Beam
Second Year Representative................A. M. Wilson
First Year Representative..................W. R. Scriven
Varsity Representative....................

The Club is addressed during the academic year by practising engineers on modern methods and problems in civil engineering.

MINING AND METALLURGICAL CLUB
1924-1925

Chairman...............................W. R. Chowen
Vice-Chairman...........................J. E. Pearen
Secretary-Treasurer......................J. S. Dickson
Fourth Year Representatives...............F. A. C. Shaw, L. M. Browne
Third Year Representatives................J. P. Dick, R. L. Piper
Second Year Representative................T. B. Smith
First Year Representative..................J. H. Ryan
Chairman Entertainment Committee..........L. M. Browne

The Club is the official organization representing the undergraduates of Departments 2 and 8 of the Faculty of Applied Science.

The objects of the Club are to promote the spirit of good fellowship and mutual assistance amongst its members, both graduate and undergraduate, to provide a means of meeting together, and for the discussion of pertinent topics.

ARCHITECTURAL CLUB

1924-1925

Hon. Chairman	Mr. Molesworth
Chairman	W. H. Steele
Vice-Chairman	J. Ryrie
Secretary	Miss E. M. Lalor
Treasurer	I. D. Matthew
Fourth Year Representative	J. Ryrie
Third Year Representative	M. H. Johnson
Second Year Representative	R. Hanks
First Year Representative	J. M. Mathers

STUDENT CHRISTIAN ASSOCIATION

The Student Christian Association now carries on the work commenced by the Young Men's Christian Association in this Faculty in 1905. The aims of the Association are to develop true Christian manhood and to be of assistance to students. Bible study groups are conducted, conferences arranged and students are given help in finding suitable rooms, etc.

OFFICERS FOR 1924-1925

Hon. President	Prof. R. W. Angus
President	W. J. Cameron
Vice-President	E. G. Davies
Secretary-Treasurer	R. P. Quance
Convenor of Study Groups	G. B. Smith

UNIVERSITY OF TORONTO STUDENTS' ADMINISTRATIVE COUNCIL

REPRESENTATIVES FROM ENGINEERING SOCIETY

President Engineering Society	J. F. Millican
Fourth Year Representative	H. C. Smith
Third Year Representative	R. E. Smythe
Second Year Representative	W. H. M. Laughlin
First Year Representative	J. C. Annesley

LODGING AND BOARD

Accommodation is readily obtainable in numerous private boarding-houses within convenient distance of the University, at a cost of from twelve dollars a week upwards for comfortable lodging with board; or rooms may be rented at a cost from six dollars a week upwards, and board obtained separately at about seven dollars per week. A list of accredited boarding-houses is kept by the Secretary of the Students' Christian Association, and students are recommended to consult him with reference to the selection of suitable accommodation.

UNIVERSITY RESIDENCES

By the generosity of Mr. and Mrs. E. C. Whitney and other friends, the University can now offer to some hundred and fifty men the peculiar advantages of residential life and excellent accommodation within its own grounds. The Residence, opened in November, 1908, consists of three Houses situated on the north side of Hoskin Avenue, opening upon a quadrangle, the fourth side of which is formed by Devonshire Place. They stand about two hundred yards to the north of University College and close to Hart House. The buildings are known as the South, East and North Houses.

Each House contains twenty-four single rooms, one single suite, one double room and eleven suites, a suite comprising a study and two bedrooms. A large room in each building, with an open hearth has been set aside as a common room. A lavatory with hot and cold shower baths is provided for every eight men. The buildings are heated by steam and lighted by electricity.

The University supplies the table, chairs, book-case, chiffonier, bed, mattress, pillows, linen and window shades for each room; it is prepared to furnish a drop-light for a nominal rental.

The rates are $4.00 per week for a single room or half of a suite, and $5.00 per week for a single suite. The rental for the Michaelmas Term is payable in advance in one instalment, that for the Easter Term is payable in two instalments—$50.00 at the opening of the term and the balance on April 1st. These charges cover heat, light, house-service, house-laundry, and the use of the telephone. There is no separate dining hall connected with the Residence, but board may be obtained at the adjacent University Dining Hall in Hart House.

Applications for rooms must be made in writing to the Secretary of the Residence Committee (address the Registrar's Office) and must be accompanied by a deposit of $5.00. This deposit will be returned if the application be not granted, and will be forfeited if a room is assigned to the applicant and not taken by him, unless notice of his refusal of the room be received by the Secretary in writing before September 15th. It will be returned in full at the end of the College year if the room key be given

back and the room and furniture left in a satisfactory condition. The following principles govern the allotment of rooms: (i) No student who, as a result of the annual Spring examinations, is not assured of being able to proceed to a subsequent year, will be admitted into the Residence. Exception to this rule will be made in the case of a student in the Faculty of Medicine who has obtained standing at the May examination, but is debarred by the rules of that Faculty from proceeding to the subsequent year until he has passed his Supplemental examinations. Such a student will be assigned a room provisionally, but cannot occupy it unless he passes his Supplemental examinations in September. (ii) The rooms in each House will be distributed between the various Faculties and Years. (iii) A limited number of rooms will be reserved for members of the incoming First Year until September 12th. (iv) Applications will be considered in order of priority.

The University lays down three general rules, designed to prevent hazing, the use of intoxicants and gambling. The students in each House shall elect a House Committee, which is entrusted by the University with the making and enforcing of any other needed rules and with the maintenance of order. A member of the Faculty resides in each House to act as friend and adviser to the men in residence.

SUMMARY OF STUDENTS REGISTERED

SESSION 1924-1925

Departments	1	2	3	4	6	7	8	Total
First Year.........	19	13	18	10	18	36	2	116
Second Year.......	25	7	21	9	21	35	3	121
Third Year.........	22	6	25	6	17	32	5	113
Fourth Year.......	22	8	28	9	24	42	5	138
Total........	88	34	92	34	80	145	15	488

UNIVERSITY OF TORONTO

CALENDAR OF THE FACULTY

OF

APPLIED SCIENCE AND ENGINEERING

1926-1927

UNIVERSITY OF TORONTO PRESS

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1926 CALENDAR 1926

JANUARY

Sun.	.	3	10	17	24	31
Mon.	.	4	11	18	25	..
Tues.	.	5	12	19	26	..
Wed.	.	6	13	20	27	..
Thur.	.	7	14	21	28	..
Fri.	1	8	15	22	29	..
Sat.	2	9	16	23	30	..

FEBRUARY

Sun.	.	7	14	21	28
Mon.	1	8	15	22	..
Tues.	2	9	16	23	..
Wed.	3	10	17	24	..
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

MARCH

Sun.	.	7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	31
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

APRIL

Sun.	.	4	11	18	25
Mon.	.	5	12	19	26
Tues.	.	6	13	20	27
Wed.	.	7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	..

MAY

Sun.	.	2	9	16	23	30
Mon.	.	3	10	17	24	31
Tues.	.	4	11	18	25	..
Wed.	.	5	12	19	26	..
Thur.	.	6	13	20	27	..
Fri.	.	7	14	21	28	..
Sat.	1	8	15	22	29	..

JUNE

Sun.	.	6	13	20	27
Mon.	.	7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	..
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

JULY

Sun.	.	4	11	18	25
Mon.	.	5	12	19	26
Tues.	.	6	13	20	27
Wed.	.	7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	31

AUGUST

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	31
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

SEPTEMBER

Sun.	.	5	12	19	26
Mon.	.	6	13	20	27
Tues.	.	7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	..
Sat.	4	11	18	25	..

OCTOBER

Sun.	.	3	10	17	24	31
Mon.	.	4	11	18	25	..
Tues.	.	5	12	19	26	..
Wed.	.	6	13	20	27	..
Thur.	.	7	14	21	28	..
Fri.	1	8	15	22	29	..
Sat.	2	9	16	23	30	..

NOVEMBER

Sun.	.	7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	..
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

DECEMBER

Sun.	.	5	12	19	26
Mon.	.	6	13	20	27
Tues.	.	7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	31
Sat.	4	11	18	25	..

1927 CALENDAR 1927

JANUARY

Sun.	.	2	9	16	23	30
Mon.	.	3	10	17	24	31
Tues.	.	4	11	18	25	..
Wed.	.	5	12	19	26	..
Thur.	.	6	13	20	27	..
Fri.	.	7	14	21	28	..
Sat.	1	8	15	22	29	..

FEBRUARY

Sun.	.	6	13	20	27
Mon.	.	7	14	21	28
Tues.	1	8	15	22	..
Wed.	2	9	16	23	..
Thur.	3	10	17	24	..
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

MARCH

Sun.	.	6	13	20	27
Mon.	.	7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	31
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

APRIL

Sun.	.	3	10	17	24
Mon.	.	4	11	18	25
Tues.	.	5	12	19	26
Wed.	.	6	13	20	27
Thur.	.	7	14	21	28
Fri.	1	8	15	22	29
Sat.	2	9	16	23	30

MAY

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	31
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

JUNE

Sun.	.	5	12	19	26
Mon.	.	6	13	20	27
Tues.	.	7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	..
Sat.	4	11	18	25	..

JULY

Sun.	.	3	10	17	24	31
Mon.	.	4	11	18	25	..
Tues.	.	5	12	19	26	..
Wed.	.	6	13	20	27	..
Thur.	.	7	14	21	28	..
Fri.	1	8	15	22	29	..
Sat.	2	9	16	23	30	..

AUGUST

Sun.	.	7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	31
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

SEPTEMBER

Sun.	.	4	11	18	25
Mon.	.	5	12	19	26
Tues.	.	6	13	20	27
Wed.	.	7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	..

OCTOBER

Sun.		2	9	16	23	30
Mon.		3	10	17	24	31
Tues.		4	11	18	25	..
Wed.		5	12	19	26	..
Thur.		6	13	20	27	..
Fri.		7	14	21	28	..
Sat.	1	8	15	22	29	..

NOVEMBER

Sun.	.	6	13	20	27
Mon.	.	7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	..
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

DECEMBER

Sun.	.	4	11	18	25
Mon.	.	5	12	19	26
Tues.	.	6	13	20	27
Wed.	.	7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	31

CALENDAR OF THE FACULTY OF APPLIED SCIENCE AND ENGINEERING 1926-1927

Michaelmas Term

1926—July 1 Thursday.... Dominion Day. University Buildings closed.
Aug. 14 Saturday.... Students third year, Dept. 1, report at Summer Survey Camp.
Aug. 21 Saturday.... Students third year, Dept. 2, report at Summer Survey Camp.
Sept. 1 Wednesday.. Last day for receiving applications for supplemental examinations.
Sept. 6 Monday..... Labour Day. University Buildings closed.
Sept. 9 Thursday.... Students fourth year, Astronomy Option, report at Summer Survey Camp.
Sept. 22 Wednesday.. Supplemental examinations commence.
Sept. 28 Tuesday..... Registration in person of the first year.
Classification Tests in first year.
Sept. 29 Wednesday.. Preliminary instruction to first year.
Registration in person of the second, third and fourth years.
The Dean's address to the first year at 9.30 a.m. in the first year draughting room.
The opening address by the President to the students of all Faculties at 3 p.m. in Convocation Hall.
Sept. 30 Thursday.... Lectures and Laboratory work commence at 9 a.m.
Oct. 1 Friday...... Meeting of Faculty Council.
Oct. 2 Saturday.... Stated meeting of the Caput to deal with requests as to social functions until November 15.
Oct. 8 Friday ...... Meeting of Senate.
Oct. 15 Friday...... Interfaculty Track Meet. Neither lectures nor laboratory classes given after 1 p.m.
Oct. 20 Wednesday.. First meeting of Engineering Society.
Nov. 3 Wednesday.. Meeting of Engineering Society.
Nov. 5 Friday...... Meeting of Faculty Council.
Nov. 6-8 Saturday-Monday.. Thanksgiving. Neither lectures nor laboratory classes given.
Nov. 12 Friday...... Meeting of Senate.
Nov. 17 Wednesday.. Meeting of Engineering Society.
Dec. 1 Wednesday.. Last day for receiving applications for supplemental examinations.
Meeting of Engineering Society.
Dec. 3 Friday....... Meeting of Faculty Council.

1926—	Dec. 10	Friday	Meeting of Senate.
	Dec. 21	Tuesday	Last day of lectures. Term ends at 1 p.m.
	Dec. 25	Saturday	Christmas Day. University Buildings closed.

EASTER TERM

1927—	Jan. 1	Saturday	New Year's Day. University Buildings closed.
	Jan. 4	Tuesday	Mid-session examinations commence.
	Jan. 6	Thursday	Lectures and laboratory work commence at 9 a.m.
	Jan. 7	Friday	Meeting of Faculty Council.
	Jan. 12	Wednesday	Meeting of Engineering Society.
	Jan. 14	Friday	Meeting of Senate.
	Jan. 21	Friday	Meeting of Faculty Council.
	Jan. 26	Wednesday	Meeting of Engineering Society.
	Feb. 4	Friday	Meeting of Faculty Council.
	Feb. 9	Wednesday	Meeting of Engineering Society.
	Feb. 11	Friday	Meeting of Senate.
	Feb. 23	Wednesday	Meeting of Engineering Society.
	Mar. 1	Tuesday	Last day for receiving applications for supplemental examinations.
	Mar. 4	Friday	Meeting of Faculty Council.
	Mar. 9	Wednesday	Meeting of Engineering Society. (Nomination Meeting).
	Mar. 11	Friday	Annual Elections Engineering Society. Meeting of Senate.
	Mar. 25	Friday	Annual General Meeting Engineering Society.
	Apr. 1	Friday	Meeting of Faculty Council.
	Apr. 8	Friday	Meeting of Senate.
	Apr. 9	Saturday	Easter Term ends. Lectures and laboratory work end at 12 noon.
	Apr. 12	Tuesday	Annual examinations commence.
	Apr. 15	Friday	Good Friday.. Neither lectures nor laboratory classes given.
	Apr. 22	Friday	Meeting of Senate.
	May 4	Wednesday	Special Meeting of Faculty Council (Examination Results).
	May 6	Friday	Meeting of Faculty Council.
	May 13	Friday	Meeting of Senate.
	May 24	Tuesday	Victoria Day. University Buildings closed.
	June 8	Wednesday	Meeting of Senate.
	June 10	Friday	University Commencement.

UNIVERSITY OF TORONTO

ADMINISTRATIVE OFFICERS OF THE UNIVERSITY

THE UNIVERSITY

President........SIR ROBERT ALEXANDER FALCONER, K.C.M.G., D.LITT. LL.D., D.D., D.C.L., OXON.
Registrar..............................JAMES BREBNER, B.A., LL.D.
Bursar........................FERDINAND ALBERT MOURÉ, MUS.DOC.
Librarian..........................WILLIAM STEWART WALLACE, M.A.
Superintendent of Buildings and Grounds..ARTHUR D'ORR LE PAN, B.A.SC.
Director of Extension Work and Publicity..WILLIAM JAMES DUNLOP, B.A.
Warden of Hart House..............JOHN BURGON BICKERSTETH, M.A.
Director of University Health Service.......GEORGE DANA PORTER, M.B.
Medical Adviser for Women Students...MISS EDITH GORDON, B.A., M.B., D.P.H.
Manager of the University of Toronto Press....RICHARD J. HAMILTON, B.A.

FACULTY OF APPLIED SCIENCE AND ENGINEERING

President........................SIR ROBERT A. FALCONER, K.C.M.G.
Dean of Faculty..CHARLES H. MITCHELL, C.B., C.M.G., C.E., LL.D., D.Eng.
Secretary of Faculty..................J. MURRAY ROBERTSON, B.A.SC.

E. A. ALLCUT, M.Sc. (Birmingham), M.I.Mech.E. — 50 St. George St. 5
Associate Professor of Mechanical Engineering.

G. R. ANDERSON, M.A. (Tor. & Harvard) — 7 Rose Park Cresc. 5
Professor of Engineering Physics and Photography.

R. W. ANGUS, B.A.Sc., M.A.S.M.E. — 42 Howland Ave. 4
Professor of Mechanical Engineering.

E. G. R. ARDAGH, B.A.Sc., F.C.I.C. — 148 Howard Park Ave. 3
Associate Professor of Chemical Engineering.

E. R. ARTHUR, B.Arch., M.A. (Liverpool), A.R.I.B.A. — 158 Albany Ave. 4
Assistant Professor of Architecture.

J. W. BAIN, B.A.Sc., F.I.C. — 393 Brunswick Ave. 4
Professor of Chemical Engineering.

E. W. BANTING, B.A.Sc. — 101 Farnham Ave. 5
Assistant Professor of Surveying.

M. C. BOSWELL, B.A.Sc., M.A. (Tor. & Harv.), Ph.D. Mining Bldg. 5
Associate Professor of Organic Chemistry (in Chemical Engineering).

J. R. COCKBURN, M.C., B.A.Sc., M.E.I.C. 100 Walmer Rd. 4
Professor of Descriptive Geometry.

S. R. CRERAR, B.A.Sc., D.L.S. 122 Grenadier Rd. 3
Associate Professor of Surveying.

F. C. DYER, B.A.Sc., M.E.I.C. 233 Ashworth Ave. 4
Assistant Professor of Mining Engineering.

P. GILLESPIE, B.A.Sc., M.Sc. (McGill), C.E., M.E.I.C. 358 Davenport Rd. 5
Professor of Civil Engineering.

G. A. GUESS, M.A. (Queen's) Oakville, Ont.
Professor of Metallurgical Engineering.

H. E. T. HAULTAIN, C.E., M.E.I.C. 156 Glencairn Ave. 12
Professor of Mining Engineering.

J. T. KING, B.A.Sc. 126 Manor Rd. E. 12
Assistant Professor of Mining Engineering.

A. T. LAING, B.A.Sc. 146 Balmoral Ave. 5
Associate Professor of Highway Engineering.

T. R. LOUDON, B.A.Sc., M.E.I.C. 189 Sheldrake Blvd. 12
Associate Professor of Applied Mechanics.

H. H. MADILL, B.A.Sc., M.R.A.I.C. 1344 Mount Pleasant Rd. 12
Assistant Professor of Architecture.

J. A. NEWCOMBE, B.Sc. (London) 2215 Gerrard St. E. 13
Assistant Professor of Metallurgy.

J. H. PARKIN, M.E., F.R.Ae.S. 10 Columbine Ave. 8
Assistant Professor of Mechanical Engineering.

H. W. PRICE, B.A.Sc. 474 Palmerston Blvd. 4
Professor of Electrical Engineering.

T. R. ROSEBRUGH, M.A. 92 Walmer Rd. 4
Professor of Electrical Engineering.

W. J. SMITHER, B.A.Sc., M.E.I.C. Apt. 11, Sussex Court 5
Assistant Professor of Structural Engineering.

L. B. STEWART, D.T.S. 17 Admiral Rd. 5
Professor of Surveying and Geodesy.

R. TAYLOR, B.A.Sc. 107 Homewood Ave. 5
Assistant Professor of Mechanical Engineering.

W. M. TREADGOLD, B.A. 13 Woodlawn Ave. E. 5
Associate Professor of Surveying.

C. H. C. WRIGHT, B.A.Sc., M.R.A.I.C. 419 Markham St. 4
Professor of Architecture.

W. J. T. WRIGHT, M.B.E., B.A.Sc. 126 Melrose Ave. 12
Assistant Professor of Engineering Drawing.

C. R. YOUNG, B.A.Sc., C.E., M.E.I.C. 98 Hilton Ave. 10
Professor of Structural Engineering.

A. R. ZIMMER, B.A.Sc. 80 Pine Crest Rd. 9
Assistant Professor of Electrical Engineering.

SESSIONAL APPOINTMENTS

S. G. BENNETT, M.C., B.A.Sc., 121 Spadina Rd. 4
Lecturer in Commercial Engineering.

L. J. BONHAM, B.A.Sc. 46 Gloucester St. 5
Demonstrator in Chemical Engineering.

R. J. BROWN, B.A.Sc. 1306 College St. 4
Demonstrator in Electrical Engineering.

D. BRUCE, B.A.Sc. 230 Beatrice St. 4
Demonstrator in Electrical Engineering.

A. R. CLUTE, B.A., LL.B. 47 Elgin Ave. 5
Special Lecturer in Limited Companies and Commercial Law.

FREDERICK COATES, A.R.C.A. Scarboro Bluffs P.O.
Instructor in Modelling.

J. L. COLTER, B.A.Sc. 41 Harbord St. 5
Demonstrator in Electrical Engineering.

W. R. COWAN, B.A.Sc. 216 Cottingham St. 5
Demonstrator in Engineering Drawing.

A. V. DELAPORTE, B.A.Sc. 5 Millerson Ave. 10
Instructor in Sanitary Chemistry.

W. B. DUNBAR, B.A.Sc. 241 Glebeholme Blvd. 6
Lecturer in Engineering Drawing.

H. B. DUNNINGTON-GRUBB, B.S.A. (Cornell) 1158 Bay St. 5
Special Lecturer in Landscape Architecture.

G. R. EDWARDS, B.A.Sc. 1263 King St. W. 3
Demonstrator in Engineering Drawing.

W. F. ELLIOT, B.A.Sc. 133 Walmer Rd. 4
Demonstrator in Engineering Drawing.

F. A. ELLIS, B.A.Sc. 719 Palmerston Ave. 4
Demonstrator in Electrical Engineering.

W. S. FERGUSON 52 Tranby Ave. 5
Special Lecturer in Accountancy and Business.

D. L. GRABILL, B.A.Sc. 28 Fairview Blvd. 6
Demonstrator in Mining Engineering.

W. H. GREAVES, M.A. (Bost.) Victoria Coll. 5
Special Lecturer in Public Speaking.

W. S. GUEST, B.A.Sc. 30 McMaster Ave. 5
Lecturer in Electrical Engineering.

A. G. GUSCOTT, B.A.Sc. (obit.)
Demonstrator in Engineering Drawing.

F. W. HUGGINS, B.A.Sc. 36 Garnock Ave. 6
Demonstrator in Mining Engineering.

C. A. HUGHES, M.M., M.A.Sc. 38 Burlington Rd., Mimico Beach, Ont.
Instructor in Applied Mechanics.

K. B. JACKSON, B.A.Sc. South House, U. of T.
Instructor in Engineering Physics and Photography.

C. W. JEFFERYS, R.C.A., O.S.A. York Mills
Instructor in Painting.
P. V. JERMYN, B.A.Sc. 109 Collier St. 5
Instructor in Engineering Drawing.
R. E. LAIDLAW, B.A.Sc. 77 Glendonwynne Rd. 9
Special Lecturer in Engineering Law.
J. S. E. MACALLISTER, B.Sc. 22 Mountview Ave. 9
Demonstrator in Hydraulics.
M. S. MACGILLIVRAY, B.Sc. (Queen's). 72 Madison Ave. 4
Demonstrator in Electrical Engineering.
R. J. MCGRATH, B.A.Sc. 58 Triller Ave. 3
Demonstrator in Engineering Physics.
A. S. MATHERS, B.A.Sc. 474 Avenue Road 5
Special Instructor in Architecture
W. G. MCINTOSH, B.A.Sc. 56 Prince Arthur Ave. 5
Lecturer in Machine Design.
J. W. MELSON, B.A.Sc. 69 Walmsley Blvd. 5
Lecturer in Surveying.
R. J. MONTGOMERY, Cer.E. (Ohio). 458 Palmerston Blvd. 4
Lecturer in Ceramics.
G. D. MOON, B.A.Sc. 34A Breadalbane St. 5
Demonstrator in Electrical Engineering.
D. D. MOSSMAN, B.Sc. (McGill) M.A. Middle House, Victoria College 5
Demonstrator in Chemical Engineering.
A. M. PATIENCE, B.A.Sc. 81 Balsam Ave. 8
Lecturer in Electrical Engineering.
W. R. PEARCE, B.A.Sc. 75 Oriole Gdns. 5
Demonstrator in Hydraulics.
H. M. S. PENTELOW. 411 Church St. 5
Demonstrator in Thermodynamics.
J. W. REBBECK, B.Sc. (British Columbia), M.A. 34 Dalton Road 4
Demonstrator in Chemical Engineering.
R. E. ROSSITER, B.A.Sc. 99 Hazelton Ave. 5
Demonstrator in Electrical Engineering.
W. L. SAGAR, B.A.Sc. Apt. 29, 383 Sherbourne St. 5
Instructor in Applied Mechanics.
H. L. SEYMOUR, B.A.Sc., C.E., A.M.E.I.C. 166 John St., Weston
Special Lecturer in Town Planning.
J. E. B. SHORTT, B.A.Sc. 401 Quebec Ave. 9
Instructor in Mechanical Engineering.
F. E. SIMPSON. 14 Lakeview Ave. 3
Assistant in Modelling.
C. W. SMALL, B.Sc. (Acad.), M.A. 459 Concord Ave. 4
Demonstrator in Chemical Engineering.
E. A. SMITH, M.A. 113½ Soudan Ave. 12
Lecturer in Chemical Engineering.

J. J. SPENCE *Demonstrator in Engineering Drawing.*	63 Stibbard Ave. 12
J. E. TOOMER, B.S. (N. Carolina State) *Lecturer in Metallurgical Engineering.*	128 Albany Ave. 4
R. T. WAINES, B.A.Sc. *Demonstrator in Machine Design.*	43 Albertus Ave. 12
P. S. WHITE, B.A.Sc. *Demonstrator in Thermodynamics.*	64 Wells Hill Ave. 10
A. C. WILSON, B.A.Sc. *Instructor in Engineering Drawing.*	283 Evelyn Ave. 9
W. S. WILSON, B.A.Sc. *Demonstrator in Engineering Drawing.*	20 Humewood Dr. 10
G. R. WORKMAN *Demonstrator in Engineering Drawing.*	22 Helena Ave. 10

MEMBERS OF OTHER FACULTIES GIVING INSTRUCTION TO STUDENTS IN APPLIED SCIENCE

S. Beatty, Ph.D., *Associate Professor of Mathematics.*	537 Markham St. 4
M. A. Buchanan, B.A., Ph.D., *Professor of Italian and Spanish.*	75 Heathdale Road 10
J. T. Burt-Gerrans, Phm.B., M.A., Ph.D. *Associate Professor of Electrochemistry.*	46 Dewson St. 4
J. H. Cameron, M.A., *Professor of French.*	96 Admiral Road 5
C. A. Chant, M.A., Ph.D., *Professor of Astro-Physics.*	201 Madison Ave. 5
A. T. DeLury, M.A., *Professor of Mathematics.*	74 St. Albans St. 5
G. H. Duff, M.A., Ph.D., *Assistant Professor of Plant Physiology.*	325 Kendal Ave. 10
B. Fairley, M.A., Ph.D., *Associate Professor of German.*	197 Dawlish Ave. 12
C. R. Fay, M.A., D.Sc., *Professor of Economic History.*	374 Brunswick Ave. 4
J. G. Fitzgerald, M.D., *Professor of Hygiene and Preventive Medicine.*	186 Balmoral Ave. 5
D. T. Fraser, M.B., D.P.H., *Assistant Professor of Hygiene and Preventive Medicine.*	190½ Lowther Ave. 4
T. Hedman, Ph.B., *Assistant Professor of German.*	Old Forest Hill Road
G. E. Holt, M.A., Mus.Bac., *Assistant Professor of German.*	280 Bloor St. W. 5
F. B. Kenrick, M.A., Ph.D., *Professor of Chemistry.*	77 Lonsdale Road 5
W. J. Loudon, B.A., *Professor of Mechanics.*	9 Woodlawn Ave. E. 5
J. W. MacArthur, M.A., Ph.D., *Assistant Professor of Genetics.*	319 Roehampton Ave. 12
M. A. Mackenzie, M.A., *Professor of Mathematics.*	1 Bellwoods Park 3
A. MacLean, B.A., *Associate Professor of Geology.*	60 St. George St. 5
W. L. Miller, B.A., Ph.D., *Professor of Physical Chemistry.*	8 Hawthorne Ave. 5
E. S. Moore, M.A., Ph.D., *Professor of Economic Geology.*	53 Hewitt Ave. 3

G. H. NEEDLER, B.A., Ph.D., *Professor of German.*	103 Bedford Road 5
W. A. PARKS, B.A., Ph.D., *Professor of Geology.*	69 Albany Ave. 4
A. L. PARSONS, B.A., *Associate Professor of Mineralogy.*	79 Oriole Road 5
L. J. ROGERS, B.A.Sc., M.A., *Associate Professor of Chemistry.*	29 Rosemount Ave. 10
H. B. SPEAKMAN, M.Sc., *Associate Professor of Zymology.*	61 Walmsley Blvd. 5
T. L. WALKER, M.A., Ph.D., *Professor of Mineralogy and Petrography.*	20 Avondale Ave. 5

SESSIONAL APPOINTMENTS

F. M. ARCHIBALD, B.Sc. (McGill) *Assistant in Electrochemistry.*	5 London St. 4
L. A. BIBET, *Instructor in French.*	47 Cecil St. 2
J. D. GARRARD, M.A., *Assistant in Chemistry.*	Chemistry Bldg. 5
H. W. HILBORN, B.A., *Lecturer in Italian and Spanish.*	42 Charles St. E. 5
S. F. KELLY, B.Sc. (Kansas), *Demonstrator in Mineralogy.*	8 Russell St. 5
D. E. KERR-LAWSON, B.A., *Demonstrator in Mineralogy.*	99 Bedford Rd. 5
O. C. H. KITCHING, B.A., *Assistant in Chemistry.*	10 Madison Ave. 5
MISS J. C. LAING, B.A., *Instructor in History and French.*	2115 Bloor St. W. 9
J. E. MAYNARD, B.A., M.Sc., *Research Assistant in Geology.*	328 Riverdale Ave. 6
D. D. MCKAY, B.A., *Assistant in Chemistry.*	150 Cottingham St. 5
R. R. ROGERS, B.A. *Assistant in Electro-Chemistry.*	121 Walker Ave. 5
R. J. WATSON, B.A., *Research Assistant in Palaeontology.*	320 Concord Ave. 4
W. C. WEBER, B.A, *Assistant in Electro-Chemistry.*	143 Bloor St. W. 5

FACULTY OF APPLIED SCIENCE AND ENGINEERING

Historical Sketch

The Legislative Assembly of the Province of Ontario during the Session of 1877 gave its sanction to the establishment of a School of Practical Science on the basis proposed in the memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council on the 3rd day of February, 1877.

By the scheme thus approved the Government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the department of science, above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction of the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor on the 30th day of October, 1889.

By an Order-in-Council, approved by the Lieutenant-Governor on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School. By the terms of this order the management and discipline of the School was vested in the Council.

On December 14th, 1900, the Senate by Statute, subsequently approved by the Lieutenant-Governor in Council, established a Faculty of Applied Science and Engineering but without assuming any liability for its support or maintenance. Under this Statute the teaching Staff and Examiners of the School of Practical Science became the teaching Staff and Examiners of the Faculty, although the University retained the right to appoint the Examiners for the Bachelor of Applied Science and professional degrees. By the University Act of 1906 the School of Practical Science became the Faculty of Applied Science and Engineering of the University of Toronto.

On April 8th, 1892, the Senate of the University established the Degree of B.A.Sc., which was open to those who held the Diploma of the School and were prepared to devote a fourth year to advanced work. In the Session 1909-1910 a new Course extending over four years and leading to the Degree of B.A.Sc. came into operation, taking the place of the long established Diploma Course of three years, which came to an end in the Session 1910-1911.

MATRICULATION

A candidate for admission to the First Year in the Faculty of Applied Science and Engineering must produce satisfactory certificates of good character and of having completed the seventeenth year of his age on or before the first of October of the year in which he proposes to register.

He must also present certificates giving him credit in the following subjects of Pass and Honour Matriculation:

PASS MATRICULATION

ENGLISH (Literature and Composition)
HISTORY (British and Ancient)
MATHEMATICS (Algebra and Geometry)
Any three of:
- LATIN (Authors and Composition)
- GREEK (Authors and Composition)
- FRENCH (Authors and Composition)
- GERMAN (Authors and Composition)
- SPANISH (Authors and Composition) *or*
  ITALIAN (Authors and Composition)
- EXPERIMENTAL SCIENCE (Physics and Chemistry) *or*
  AGRICULTURE (Parts I and II)

*Arithmetic *and* Certificates in Mechanical Drawing and shop work from the Principal of the School, accompanied by an approving certificate from the Director of the Technical School Branch of the Department of Education for Ontario.

HONOUR MATRICULATION

(At least 50%)

ENGLISH (Literature and Composition).
MATHEMATICS (Algebra, Geometry and Trigonometry).
One of:
- LATIN (Authors and Composition).
- GREEK (Authors and Composition).
- FRENCH (Authors and Composition).
- GERMAN (Authors and Composition).
- SPANISH (Authors and Composition).
- ITALIAN (Authors and Composition).

In selecting the options it is recommended that students take French, German and Experimental Science. In the Department of Architecture, French is recommended, in the Departments of Chemical Engineering and Mechanical Engineering it is desirable that students take German. For

*This option applies to students—and to such students only—who have been in attendance at and matriculate from a Technical School in the Province of Ontario and certified as such by the Department of Education of the Province.

students intending to take Metallurgical Engineering, Spanish and Experimental Science are recommended.

The regulations respecting Matriculation, together with a schedule of examinations which may be accepted as equivalent, may be found in the Curriculum for Matriculation on application to the Registrar of the University.

A candidate from the British Isles must present a certificate showing that he has passed or has exemption from the Preliminary Examination of the Institution of Civil Engineers.

ADMISSION

Applications for admission must be made on blank forms supplied by the Registrar, and should be forwarded as early as possible to the Registrar of the University, together with all Pass and Honour Matriculation or equivalent certificates.

Applications based upon certificates other than those mentioned will be considered as occasion may require. Such certificates must be accompanied by an official statement of the marks in the various subjects upon which the certificate was granted.

ADMISSION *AD EUNDEM STATUM*

An undergraduate of another University may be admitted *ad eundem statum* on such conditions as the Senate on the recommendation of the Council of the Faculty may prescribe.

An applicant for admission *ad eundem statum* must submit with his petition (1) a calendar of his University giving a full statement of the courses of instruction; (2) an official certificate of character and academic standing.

REGISTRATION

Students in any year will be required to register in person on the date specified in the Calendar for the registration of students in that year. Those who present themselves on subsequent days must petition the Council to be allowed to register. Council reserves the right to reject applications of, or impose penalties upon, those who fail to report on the dates specified.

ENQUIRIES

Enquiries with reference to requirements of admission to the Faculty of Applied Science and Engineering are to be addressed to the Registrar of the University.

Communications relating to curricula, instruction, examinations and standing therein, in the Faculty of Applied Science and Engineering are to be addressed to the Secretary of the Faculty.

DEGREES

Degree of Bachelor of Applied Science (B.A.Sc.)

Degree of Bachelor of Architecture (B.Arch.)

There are six graduating Departments leading to the Degree of Bachelor of Applied Science (B.A.Sc.) and one graduating Department leading to the Degree of Bachelor of Architecture (B.Arch.), viz.,

1. Civil Engineering.
2. Mining Engineering.
3. Mechanical Engineering.
4. Architecture.
5. (Discontinued.)
6. Chemical Engineering.
7. Electrical Engineering.
8. Metallurgical Engineering.

Descriptions of the courses in these Graduating Departments are given on pages 40, 45, 48, 52, 55, 58, 61.

In the fourth year, optional courses are arranged in certain departments. Students are required to submit their selection to the Secretary in writing, not later than September 15th. The proposed selection must be approved by Council before adoption.

Degree of Master of Applied Science (M.A.Sc.)

Degree of Master of Architecture (M.Arch.)

Graduates holding the Degree of B.A.Sc. of this University or those holding the degree of another University recognized as equivalent, may take post-graduate work proceeding to the Degree of Master of Applied Science (M.A.Sc.). (For requirements, see page 110.)

Graduates holding the Degree of B.Arch. or B.A.Sc. in Architecture of this University, or those holding the Degree of another University recognized as equivalent, may take post-graduate work proceeding to the Degree of Master of Architecture (M.Arch.). (For requirements, see p. 110.)

Professional Degrees

Graduates in Applied Science and Engineering, and graduates of the School of Practical Science, may, after three years spent in professional work, present themselves for the degrees of Civil Engineer (C.E.), Mining. Engineer (M.E.), Mechanical Engineer (M.E.), Electrical Engineer (E.E.). Chemical Engineer (Chem. E.), Metallurgical Engineer (Met. E.), as the case may be, subject to the rules and regulations established by the University. (See page 110.)

FEES

All fees are payable at the Bursar's office between the hours 10 a.m. and 1 p.m. of each week day except Saturday (or may be remitted by mail).

The annual fees, including tuition, library, laboratory supplies and one annual examination for each year, shall be as follows:

If paid in full on or before November 5th	$150.00
If paid by instalments.—	
First instalment, if paid on or before November 5th	75.00
Second instalment, if paid on or before February 5th	78.00
Repeating the year—If paid in full on or before November 5th	75.00

The above fees are payable in advance. After November 5th a penalty of $1.00 per month will be imposed until the whole amount is paid. In the case of payment by instalments the same rule as to penalty will apply.

Students must have paid the fees due in the first term before proceeding to the work of the second term.

General Fees

Matriculation, or registration of Matriculation	$ 5.00
Supplemental examination	10.00
Admission *ad eundem statum*	10.00
Degree of B.A.Sc.	10.00
Degree of B. Arch	10.00
Physical Training (see page 21)	5.00
Supplemental Physical Training (see page 21)	10.00
Hart House (see below)	8.00
Students' Administrative Council (see page 21)	3.00

Dues and Deposits

All dues and deposits are payable at the office of the Faculty at the time of Registration. Cheques must be made out in favour of "Faculty of Applied Science and Engineering".

Engineering Society membership	$2.00
Athletic Association membership	2.00
Annual deposit, Departments 1, 3, 4, 7	3.00
Departments 2, 6, 8	8.00

Charges for waste, neglect and breakage are to be met out of the deposit fee, the balance of which will be refunded to the student at the end of the session on application to the Secretary.

If the foregoing deposits do not cover the cost of breakage due to carelessness or neglect, the balance shall be paid by the student to the Secretary.

Hart House Fee

Every male student in attendance, proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering, is required to pay to the Bursar before December 1st the annual fee of eight dollars for the

maintenance of Hart House. If this fee is not paid by the above date a penalty of two dollars will be imposed, making the total fee ten dollars.

STUDENTS' ADMINISTRATIVE COUNCIL FEE

Every student in attendance, proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering, is required to pay to the Bursar at the time of the entry of his name with the Secretary the annual fee of three dollars for the support of the Students' Administrative Council.

PHYSICAL TRAINING FEE

Every male student in attendance proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering is required to pay to the Bursar the annual Physical Training fee of $5.00 at the opening of each session in which Physical Training is compulsory for that student.

A student who has failed to complete satisfactorily the course in Physical Training prescribed for the First Year will not be permitted to register in the Third Year; and the student who has failed to complete satisfactorily the course in Physical Training prescribed for the Second Year will not be permitted to register in the Fourth Year.

Every student who has neglected to complete satisfactorily the course in Physical Training of the First or Second Year, and who must take this work during the Second or Third Year respectively of his course, will be required to pay to the Bursar at the opening of the session a Supplemental Fee of $10.00, in addition to the prescribed Physical Training fee.

SCHOLARSHIPS AND PRIZES

Through the generosity of friends of the University, encouragement has been given to both undergraduate and graduate work in the various branches, by establishing the following scholarships and prizes:

Name of Scholarship	Years Eligible	Amount	Described on page
Ontario Association of Architects...	I	$100	22
Mrs. M. W. Baptie..............	I	$100	22
Harvey Aggett..................	II	$ 75	22
Boiler Inspection & Insurance Co....	III	$150	22
Jenkins Brothers, Limited..........	III	$100	22
Toronto Architectural Guild........	IV	....	22
B.A.A.S. Medal..................	IV	....	23
C. J. Rhodes.....................	II, III, IV	£300	23
Khaki University & Y.M.C.A.......	II, III, IV	Loans	24
Jardine Memorial.................	All	$100	24
F. W. Jarvis Bursaries	All	$50	25
S. Ubukata......................	All	....	25
U. of T. War Memorial............	All	$250	25
Æneas McCharles..................	All & Grad.	$1,000	25
1851 Exhibition...................	Graduate	£250	26
Nipissing Mining Co..............	Graduate	$1,100	28

ONTARIO ASSOCIATION OF ARCHITECTS' ARCHITECTURAL SCHOLARSHIP

The Ontario Association of Architects offers a scholarship in the Department of Architecture of the value of $100 to the student who has obtained the highest standard of general proficiency during the first year. This scholarship will be awarded annually in May, 1922 to 1926 inclusive.

THE BAPTIE SCHOLARSHIP

The Baptie Scholarship is derived from a bequest under the will of the late Mrs. Margaret W. Baptie, of Ottawa, and the Board of Governors has directed that from the income therefrom a scholarship of One Hundred Dollars shall be awarded for Engineering students on the record of their first year. . . . The Board of Governors also authorizes a remission of fees in the case of the holder of the scholarship up to Seventy-five Dollars.

The conditions of the award are as follows: That the scholarship be awarded to the student who, in the Annual Examinations of the First Year, enrolled in any one of the departments of Civil Engineering, Mining Engineering, Mechanical Engineering, Chemical Engineering, Electrical Engineering or Metallurgical Engineering, obtains the highest aggregate percentage of marks in those subjects which are common to the First Year curricula of those departments. The first award is to be made on the results of the Annual Examinations of the Session 1925-26.

HARVEY AGGETT MEMORIAL SCHOLARSHIP

This scholarship was donated by Mr. J. T. Aggett, of Toronto, as a perpetual memorial to his son, the late Lieutenant Harvey Aggett, who enlisted in March, 1915, during his second year in this Faculty, and was killed in action at Passchendaele on 6th November, 1917.

This annual scholarship of the value of seventy-five dollars is to be awarded to a student of the second year in this Faculty who, obtaining honours and being one of the first three in his year by his standing at the annual examinations, has been adjudged highest of the three in general student activities and service in the University during his period of attendance.

BOILER INSPECTION AND INSURANCE COMPANY SCHOLARSHIP

The Boiler Inspection and Insurance Company of Canada offers a Scholarship in the Department of Mechanical Engineering of the value of $150.00 to the student who obtains highest Honour Standing in the regular examinations of the third year.

The successful candidate will be expected to proceed to his fourth year during the session next following the date of the award.

The amount of the award will be credited by the Bursar to the fees of the fourth year of the successful candidate.

JENKINS SCHOLARSHIP IN ENGINEERING

The Jenkins Scholarship in Engineering, presented by Jenkins Bros., Limited, has been donated to continue for a period of five years, the first award to be made in 1925.

This annual scholarship, of the value of One Hundred Dollars, is to be awarded to the student of the third year registered in one of the six departments of Civil, Mining, Mechanical, Chemical, Electrical or Metallurgical Engineering, who has the highest aggregate of percentages for the first, second and third years, relative to the requirements of his department.

TORONTO ARCHITECTURAL GUILD MEDAL

The Toronto Architectural Guild was the organization of local architects from which sprung the Ontario Association of Architects. When the new and wider association became firmly established, the Guild disbanded and handed over to a trustee board certain funds for the establishment of a Medal to be awarded in the Department of Architecture of the University of Toronto.

The Trustee Board, now that the fund has accumulated considerably, announces its intention of awarding this medal annually to a senior student showing outstanding ability in Architectural Design.

MEDAL FROM MEMBERS OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

A Bronze Medal has been donated for students of the Faculty of Applied Science and Engineering by members of the British Association for the Advancement of Science. This Medal will be awarded to the student of the Fourth Year, in any department, who, taking honours, obtains the highest aggregate percentage, in practical and written examinations in the year

THE RHODES SCHOLARSHIP

The trustees of the late Mr. C. J. Rhodes have assigned two of the Rhodes Scholarships to the Province of Ontario.

These scholarships will hereafter be thrown into open competition in the Province, subject to the following conditions:—

1. Candidates must be British subjects, with at least five years' domicile in Canada, and unmarried. They must have passed their nineteenth, but not have passed their twenty-fifth birthday, on October 1st of the year for which they are elected.

2. Candidates must be at least in their Sophomore Year at some recognized degree-granting University or College of Canada, and (if elected) complete the work of that year before coming into residence at Oxford.

3. Candidates may compete either in the Province in which they have acquired any considerable part of their educational qualification, or in the Province in which they have their ordinary private domicile, home or residence.

In each Province there is a Committee of Selection, appointed by the Trustees, in whose hands the nominations will rest. The Secretary of the Committee of Selection for Ontario is Norman S. Macdonnell, Esq., Barrister, Sun Life Building, Toronto.

The Committees of Selection are instructed to bear in mind the suggestions of Mr. Rhodes, who wished that, in the choice of his Scholars, regard should be had to

(*a*) Force of character, devotion to duty, courage, sympathy, capacity for leadership.

(*b*) Ability and scholastic attainments.

(*c*) Physical vigor, as shown by participation in games or in other ways.

Every candidate for a Scholarship is required to furnish to the Committee of Selection for his Province the following:—

(*a*) A certificate of age.

(*b*) A photograph preferably unmounted and not larger than 4×7 inches.

(*c*) A written statement from the President or Acting President of his College or University to the effect that his application as a suitable candidate is approved.

(*d*) Certified evidence as to the courses of study pursued by the Scholar at his University, and as to his gradings in those courses. This evidence should be signed by the Registrar, or other responsible official, of his University.

(*e*) A brief statement by himself of his athletic and general activities and interests at College, and of his proposed line of study at Oxford.

(*f*) Not more than four testimonials from persons well acquainted with him.

(*g*) References to four other responsible persons, whose addresses must be given in full, and of whom two at least must be professors under whom he has studied.

It is in the power of the Committee of Selection to summon to a personal interview such of the candidates as they find desirable to see, and, save under exceptional circumstances, no Scholar will be elected without such an interview. Where such an interview is dispensed with, a written statement of the reasons will be submitted to the Trustees.

The next appointments will be made for 1927; applications for these Scholarships with all required material must reach the Secretary of the Committee of Selection not later than October 20th, 1926.

Each Scholarship is of the value of £300 a year, and is tenable for three years, subject to the continued approval of the College at Oxford of which the Scholar is a member. In addition a scholar will receive, until further notice, an annual bonus of £50.

Rhodes Scholars,, from this Faculty:—

W. J. Browne, B.A.Sc., 1919.

D. W. Dow, 1925.

The Khaki University and Y.M.C.A. Memorial Scholarship Fund

The Khaki University and Y.M.C.A. Memorial Scholarship Fund was established by the Khaki University Committee. At the present time this fund is being used to make loans to returned-soldier students of the higher years. Applications for such loans should be made to the President of the University.

The Jardine Memorial Prize for English Verse

1. This prize, of the value of $100, is the gift of the late Mrs. T. Herbert Barton in memory of her brother Flight-Lieutenant Gordon Jardine, and is open to any regular undergraduate student who has been in actual attendance at the University during the academic year preceding the date of submission (November 1) or who graduated in the previous academic year.
2. The subject and metre of the poem shall be left to the choice of the competitor.
3. The poems shall be in the hands of the Registrar of the University by November 1st.
4. Each poem shall be signed with a pseudonym and the competitor's name shall be submitted to the Registrar in a sealed envelope on which the pseudonym shall be written.
5. With his or her name the competitor shall enclose a signed statement that the poem is absolutely his or her original work.
6. The competition shall be judged by a board of five examiners, consisting of the head of the Department of English in each of the four colleges, and of a fifth examiner to be chosen by these four.
7. The examiners shall have the power to withhold the award in any year if no poem which has been submitted for that year be found worthy of the prize.

The Ubukata Fund

The S. Ubukata Fund of $10,000, the gift of Mr. S. Ubukata, provides for the establishment of prizes, medals, scholarships and loans for which Japanese students of all faculties and colleges may be eligible. Information regarding the conditions of award may be obtained from the Registrar of the University.

The F. W. Jarvis Bursaries

Two Bursaries, known as "The F. W. Jarvis Bursaries", of the value of $50 each, the gift of A. H. Jarvis, Esq., of Ottawa, brother of F. W. Jarvis, to be awarded under the following conditions:

1. These Bursaries are open only to former students of Ottawa Collegiate Institute (Lisgar Street), who without some such assistance may not be able to carry on their academic courses.
2. They may be awarded at Matriculation or in any year of an undergraduate course in any Faculty of the University.

3. They shall be awarded preferably one to a man and the other to a woman student; but if in any year students of opposite sexes do not apply, both Bursaries may be awarded to men or to women.

4. A Bursary may be held in successive years by the same student and also in conjunction with any scholarship awarded by the University or the federated colleges.

5. The Bursaries shall be awarded by the Senate of the University on the recommendation of a Committee of Award consisting of the President of the University, the Principal of Ottawa Collegiate Institute and the donor; candidates shall make application for the same not later than May 15th on the special form to be obtained from the Registrar.

THE UNIVERSITY OF TORONTO WAR MEMORIAL SCHOLARSHIPS

Three Scholarships, each of the value of two hundred and fifty dollars have been established by the Alumni Federation of the University from the War Memorial Fund to be awarded to students in the Faculty of Applied Science and Engineering.

The general basis on which the above scholarships may be awarded is as follows:

(*a*) Standing in course of studies.
(*b*) Need of assistance.
(*c*) Relationship, if any, to active service during the War.
(*d*) Such other general qualifications of merit as may commend themselves to the Committee.

Information regarding these scholarships may be obtained from the Secretary-Treasurer of the Alumni Federation, Room 225, Simcoe Hall, to whom applications for the same must be made not later than Feb. 15th.

THE MCCHARLES PRIZE

This prize was established in connection with the bequest of the late Æneas McCharles of Provincial Government bonds of the value of $10,000, and is awarded on the following terms and conditions, namely, that the interest therefrom shall be given from time to time, but not necessarily every year, like the Nobel prizes in a small way: (1) To any Canadian from one end of the country to the other, and whether student or not, who invents or discovers any new and improved process for the treatment of Canadian ores or minerals of any kind, after such process has been proved to be of special merit on a practical scale; (2) Or for any important discovery, invention or device by any Canadian that will lessen the dangers and loss of life in connection with the use of electricity in supplying power and light; (3) Or for any marked public distinction achieved by any Canadian in scientific research in any useful practical line. The following conditions, as passed by the Board of Governors, determine the method of award:—

(1) The title shall be the McCharles Prize.

(2) The value of the prize shall be One Thousand Dollars ($1,000.00) in money.

(3) The term "Canadian" for the purpose of this award shall mean any person Canadian born who has not renounced British alliance; and for the purpose of the award in the first of the three cases provided for by the bequest, domicile in Canada shall be an essential condition.

(4) Every candidate for the prize shall be proposed as such in writing by some duly qualified person. A direct application for a prize shall not be considered.

(5) No prize shall be awarded to any discovery or invention unless the same shall have been proved to the satisfaction of the awarding body, to possess the special practical merit indicated by the terms of the bequest.

(6) The order of priority in which the three cases stand in the wording of the bequest shall be observed in making the award; that is, the award shall go *caeteris paribus* to the inventor of methods of smelting Canadian ores; and, failing such inventions, to the inventor of methods for lessening the dangers attendant upon the use of electricity; and only in the third event, if no inventors of sufficient merit in the field of metallurgy and electricity present themselves, to the inventor distinguished in the general field of useful scientific research.

(7) The first award was made in 1910.

(8) The composition of the awarding body shall be as follows:—

An expert in Mineralogy,
An expert in Electricity,
An expert in Physics,

and four other persons. All of the members of this body shall be nominated by the Board of Governors of the University of Toronto.

THE 1851 EXHIBITION SCIENCE RESEARCH SCHOLARSHIP

The Royal Commissioners for the Exhibition of 1851, if satisfied with the qualifications of the candidates put forward, will each year allot three Science Research Scholarships to Canada. The University of Toronto has been invited to recommend annually one or more candidates in order of merit for these Scholarships.

1. Each candidate recommended must be a British subject and under twenty-six years of age, except under very special circumstances; he must be a bona fide student of Science of not less than three years' standing; he must also have completed a full University course and have spent at least one full academic year at this University prior to the date of recommendation.

2. The record of a candidate's work must indicate high promise of capacity for advancing science or its applications by original research. Evidence of this capacity, which is the main qualification for the Scholarship, is strictly required. The most suitable evidence is a satisfactory account by the candidate of research work already performed, and the

Commissioners will decline to consider the claims of a candidate unless such an account is furnished, or unless there is other equally distinct evidence that he possesses this qualification.

3. Applications for these Scholarships must be made to the Registrar of the University not later than April 15th; the latest date on which the recommendation of the University of Toronto for Scholarships offered in 1927 can be received at the Office of the Commissioners is June 1st, 1927.

4. Each Scholarship is of the value of £250 per annum, payable quarterly in advance; on presenting to the Commissioners a satisfactory final report at the expiration of his Scholarship the scholar will receive a grant of £25. A scholar who is not in a position to travel at his own expense, or for whom it is not possible to obtain free passage, may make application to the Commissioners for aid towards the payment of his fare from his home to his place of study. A Scholar will receive an additional annual allowance, not exceeding £30, towards the cost of University fees, if, in the opinion of the Commissioners, he is in need of such allowance.

5. The Scholarship will be tenable ordinarily for two years, and in cases of exceptional merit for three years. The continuation of a Scholarship for a second year will depend upon the satisfactory nature of the scholar's first year's work. Renewal for a third year will be granted only where it appears that the renewal is likely to result in work of scientific importance.

6. The scholar will be required to devote himself to research in some branch of pure or applied science, the particular nature of the work proposed to be approved by the Commissioners.

7. A scholarship may be held, with the approval of the Commissioners, at any Institution in the United Kingdom or abroad, but a scholar will not be permitted, except under very special circumstances, to conduct his investigations in the country in which he has received his scientific education.

8. Scholars will be required to furnish reports of their work at the end of each year of tenure of their scholarships.

9. Scholars will be required to devote their whole time to the objects of the scholarship, and will be forbidden to hold any position of emolument which carries with it a duty inconsistent with their obligation to the Commissioners. Scholars must in any case obtain the consent of the Commissioners before accepting any additional emoluments.

10. In case of misconduct on the part of a scholar the Commissioners may, at their absolute discretion, deprive him of his scholarship and all emoluments therefrom.

The regulations adopted by the Senate are as follows:—

The departments, students of which shall be eligible to be candidates, are:—1. Bacteriology; 2. Biochemistry; 3. Botany; 4. Chemistry; 5. Engi-

neering (chemical); 6. Engineering (civil); 7. Engineering (electrical); 8. Engineering (mechanical); 9. Engineering (metallurgical); 10. Engineering (mining); 11. Forestry; 12. Geology; 13. Mineralogy; 14. Physics; 15. Physiology; 16. Zoology.

A student shall not be deemed to be ineligible because of his being on the teaching staff of the University, if he has not been in receipt of a salary of more than $800 per annum and has not been on the teaching staff for more than two years from graduation.

A student shall be deemed to be eligible in the year in which he intends to graduate, but if nominated for the Scholarship his nomination shall be subject to his being successful in passing his examination for his degree.

The nomination of the candidate or candidates shall be made by a Board composed of seven members appointed by the Senate, and the Board shall consist of the Chancellor, the President, the Reverend Dr. Bowles, the Honourable Mr. Justice Masten, the Honourable W. E. Raney, Dr. J. A. Worrell and Dr. C. Morse, and the Board shall have power to call to its aid as assessor any member of the teaching staff.

The Nipissing Mining Company Research Fellowship

The Nipissing Mining Company has endowed a Research Fellowship in the Department of Mining Engineering to be known as The Nipissing Mining Company Research Fellowship, of the annual value of eleven hundred dollars ($1,100.00).

This Fellowship is open to the graduates of any University.

JUNIOR INSTRUCTORSHIPS

Provision is made for the sessional appointment in various departments of graduates as Fellows or Demonstrators, whose duties shall consist of aiding in the work of instruction under the direction of the department concerned.

Applications for appointment should be made in writing to the Secretary of the Faculty not later than September 1st.

Research Assistantships

A number of research assistants in the School of Engineering Research are appointed annually on salary, in the various departments, to carry on the work of research under the direction of members of the staff. This work is accepted as partial fulfilment of the requirements for the degrees of M.A.Sc. and M.Arch. These research assistants are usually recent graduates and are chosen from among those who have displayed special capacity for investigational work in their undergraduate courses. Prospective applicants should consult with members of the staff as soon as possible after the annual examinations.

REGULATIONS RESPECTING EXAMINATIONS

REGULAR EXAMINATIONS

Promotions from one year to another are made on the results of the term work and the annual examinations. A Student proceeding to a degree must pass all the term work and the examinations in the subjects of his course and at the periods arranged from time to time by the Council.

Candidates who fail to pass in any year will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they fail before presenting themselves a second time for examination. (This repetition includes vacation work.)

A student who in either term of the session fails to perform the work of his course in a manner satisfactory to the professors in charge, will not be allowed to present himself at the final examinations of the year.

In the second, third and fourth years annual examinations will be held at the beginning of the second term on all subjects completed during the first term.

No student will be allowed to write at any examination who has not paid all fees and dues for which he is liable at that time.

The pass marks required on written examinations is 40% and on practical examinations 60%.

Honours will be granted in each department to the students who obtain at least 50 per cent. in each subject, and 75 per cent. of the total number of marks allotted to the department at the annual examinations.

Honour Graduate standing will be granted to those who obtain honours in the final and in one previous year.

TERM EXAMINATIONS

Term examinations may be held in any subject and at any time at the discretion of the instructor or by order of the Council, and the results of such examination may, if the Council so decides, be incorporated with those of the annual examinations in the same subjects.

SUPPLEMENTAL EXAMINATIONS

A candidate who fails in one or two subjects at the Annual Examinations will be required to take supplemental examinations in such subjects; but no student will be allowed a supplemental examination in the laboratory work of the fourth year, those reported as failing to attain the required standard in this laboratory work not being allowed to present themselves at the final examinations.

The supplemental written examinations will begin on the 22nd day of September, 1925. Notice in writing of his intention of taking such examinations (including practical ones) must be received from the candidate by the Secretary of the Faculty, and the fee of $10.00 received by the Bursar, not later than the first of September. Council reserves the right to reject applications of, or impose penalties upon, those failing to comply

with these requirements. Arrangements will be made to conduct supplemental examinations at the Survey Camp for those students in attendance.

In the case where a candidate desires to write upon an annual examination as a supplemental, his application must be received by the Secretary, and his fee by the Bursar, for the January examinations not later than the first of December and for the April examinations not later than the first of March.

Where a candidate fails to pass a supplemental examination it will be counted as one of the two supplemental examinations which may be allowed him after the next annual examination.

No student will be permitted to take the work required for a laboratory supplemental examination at any time other than the regular time of the session.

VACATION NOTES

All Departments

Vacation notes must be submitted to the Department of Engineering Drawing on or before the first day of the session.

Vacation notes must be on construction only, and contain not less than twenty, nor more than thirty pages of sketches (except in the Department of Architecture). These sketches must be freehand pencil drawings with figured dimensions.

Notes must be made in standard note books approved by the Faculty. Notes which have been taken during the session in connection with the work in drawing will not count as vacation work.

The minimum percentage of marks required for practical work must be made in the case of vacation notes. (See page 108.)

VACATION LETTERS

Department of Mining Engineering

THIRD YEAR STUDENTS:—Four letters to be written and mailed to the Professor of Mining Engineering, one each month, June, July, August and September; at least one letter must deal with a labour episode.

FOURTH YEAR STUDENTS:—The student may select either one of the following alternatives:—

A. Four letters to be written and mailed, one each month, June, July, August and September; at least one letter to be on a labour episode: or

B. One letter describing a labour episode to be written and mailed to the Professor of Mining Engineering not later than June 30th, and an article of suitable character and length for submitting to the Engineering Institute of Canada or the Canadian Mining Institute as a student's paper, to be written and mailed to the Professor of Mining Engineering not later than September 30th. (See page 76).

FIELD EXPERIENCE

Department of Mining Engineering

The following are the regulations governing field experience certificates:

A candidate for the degree in the Department of Mining Engineering will be required to present satisfactory evidence of having had at least six months' practical experience in work connected with mining, metallurgy or geology, for which he must have received regular wages.

The time may be spent on geological survey, in ore dressing, smelter or lixiviation works, in an assay office in the vicinity of mining or metallurgical works, on any work in or about a mine other than as an office man or clerk, or in prospecting. Not more than three months on geological surveys will be accepted, and prospecting will only count one-half (*i.e.*, four months' prospecting will be counted as two months) and must not be submitted for more than three of the six months.

Certificates must be made out, signed, countersigned and sent during the first term to the Secretary of the Faculty of Applied Science and Engineering, who will retain them.

SHOP WORK

Departments of Mechanical and Electrical Engineering

Students in Mechanical and in Electrical Engineering are not granted their degree until certificates have been submitted to the Council, and accepted as satisfactory, showing not less than 1,600 hours of mechanical experience in production under commercial conditions. Preferably the work undertaken should be in one of the manufacturing industries or trades with which the course is related. Certificates, on the standard form which may be procured from the Secretary, must be presented on or before the 1st of March of any year.

It is not desirable that a student in these courses should enter the engineering industries without having acquired some experience in mechanical production and it is therefore required that he obtain this experience under commercial conditions, so that he can appreciate shop conditions and limitations.

REGULATIONS RESPECTING TERM WORK

Students working in any laboratory must be governed by the regulations relating thereto as made known from time to time.

No laboratory reports or drawings may be removed from the laboratories without permission. The Council reserves the right to dispose of them as may be thought proper.

Field Work

Field Work in Surveying of the First and Second Years will be taken on the University grounds, during the first term.

No field notes will be accepted which have not been taken in the field and during the hours allotted to such work.

Students taking practical astronomy are required to take observations in the field for time, latitude and azimuth.

Departmental Excursions to Points of Interest

As a part of Laboratory Instruction excursions to points of technical interest, both in Toronto and elsewhere, are arranged by the staff. These excursions are treated as laboratory periods with the same requirements as to attendance and reports. The total transportation costs in any one year will probably not exceed Ten Dollars.

Summer Survey Session

Students in Departments 1 and 2 will be required to take the Survey Camp between the second and third years, and on failure to do so this work will be taken as a supplemental in the third year. The work will be taken previous to the opening of the fall term, during the months of August and September at the University Survey Camp, situated on the shore of Gull Lake, and about five miles from the Village of Minden (Lot No. 9 in 13th Concession of the Township of Lutterworth). The camp may be reached by taking the train leaving Lindsay for Haliburton, and getting off at Gelert. Conveyances will be on hand to meet students and take them to the camp. Personal effects must be limited to sixty pounds in weight, which must include two pairs of blankets, or their equivalent; beds and mattresses only will be provided.

A field course in Geology will be given students in Department 2 the last week of the session at the camp.

Students will report at the camp on the dates shown on page 7.

Students of the Fourth Year in Department 1 who are taking the Astronomy Option are required to spend two weeks at the camp, beginning September 9th, after completing their Third Year.

Drafting Rooms

No drawings or briefs will be accepted which have not been made in the drafting rooms, and during the hours allotted to such work.

Theses

In the Fourth Year each student is required to prepare a thesis. The title, form and time for handing in will be determined for each Department as provided in the prescription, 285, page 108. It shall become the property of the University.

The thesis of each student who works upon a research problem in his fourth year must deal with the subject of investigation. In such cases the theses must be handed in not later than one week prior to the close of the annual examinations.

REGULATIONS RESPECTING STUDENTS IN ATTENDANCE

All interference on the part of any student with the personal liberty of another by arresting him, or summoning him to appear before any unauthorized tribunal of students, or otherwise subjecting him to any indignity or personal violence, is forbidden by the Caput.

A student who is under suspension, or who has been expelled from a College or from the University, will not be admitted to the University buildings or grounds.

The name of the University is not to be used in connection with a publication of any kind without the permission of the Caput.

No student will be enrolled in any year, or be allowed to continue in attendance, whose presence is deemed by the Council to be prejudicial to the interests of the University.

Students proceeding regularly to the degree are required to attend the courses of instruction and the examinations in all subjects prescribed for students of their respective standing, and no student will be permitted to remain in the University who persistently neglects academic work.

Unless special permission is granted by the Council, a student who, at the close of two sessions in the University, has failed to secure standing in his year, will not be permitted registration in the Faculty of Applied Science and Engineering.

The constitution of every University society or association of students in the Faculty of Applied Science and Engineering and all amendments to any such constitution must be submitted for approval to the Council of the Faculty. All programmes of such societies or associations must, before publication, receive the sanction of the Council of the Faculty through the Dean. Permission to invite any person not a member of the Staff of the University to preside at or address a meeting of any society or association must be similarly obtained.

The Students' Administrative Council has been entrusted by the Caput with supervision of the conduct of the students, and subject to the approval of the Caput, has power, through the Students' Court or otherwise to deal with violations of the regulations governing conduct.

No initiation ceremony involving physical violence, personal indignity, interference with personal liberty or destruction of property, may be held by the students of any Faculty or College of the University under the penalty of suspension or expulsion.

Any ceremony connected with the reception of the First Year desired by any Faculty or College must be prepared and carried out by a Committee of the Senior Year of the Faculty or College concerned, with the approval of a joint committee of the Caput and the Students' Administrative Council. The holding of such ceremonies except with this approval shall constitute a breach of discipline.

Any student who may be convicted of having taken part in a parade or procession through the city which has not been authorized by the police authorities after application by the Executive of the Students' Administrative Council, will be severely disciplined.

EXEMPTIONS

Applications for exemption from any of the regulations shall be made to the Council in writing and the particulars of the case fully stated.

A student shall submit to Council evidence of illness or other handicap which occurs during the session immediately after its occurrence: no petition for leniency on account of such incidents will be considered if received after the third day following the last day of examinations.

GENERAL INFORMATION FOR STUDENTS

The Council of University College and the governing bodies of the federated universities and colleges, respectively, have disciplinary jurisdiction over and entire responsibility for the conduct of their students in respect of all matters arising or occurring in or upon their respective college buildings and grounds, including residences.

The councils of such of the faculties as have assigned for their separate use any building or buildings and grounds, including residences, have disciplinary jurisdiction over and entire responsibility for the conduct of all students in their respective faculties in respect of all matters arising or occurring in or upon such building, or buildings and grounds.

In all such cases, and, save as aforesaid, as respects all students to whatso ever college or faculty they may belong, disciplinary jurisdiction is vested in the Caput, but the Caput may delegate its authority in any particular case or by any general regulation to the council or other governing body of the university or college or faculty to which the student belongs.

The Caput has also power and authority to determine by general regulations, or otherwise, to what college, faculty or other body the control of university associations belongs.

If there be any questions as to the proper body to exercise jurisdiction in any matter of discipline which may arise, the same shall be determined by the Caput, whose decision shall be final.

Disciplinary jurisdiction includes the power to impose fines.

Information as to the text-books, instruments and materials to be purchased by the students will be given on registration at the beginning of the session.

HART HOUSE

Hart House, the gift of the Massey Foundation, is so called in memory of Mr. Hart Massey. In its widest interpretation it seeks to provide for all the activities in the undergraduate's life apart from the actual work in the lecture room. It affords all the facilities of a first-rate club. In the beauty of its architecture and the various functions which it performs it is unique on this continent.

Hart House contains completely equipped club rooms, including common rooms, reading room, music room, lecture room, sketch room, photographic dark rooms, the Great Hall, which is the students' dining hall, a small Chapel, rooms reserved for religious organizations in the University, gymnasia, squash courts, swimming pool, running track, rifle range, billiard room, library and Hart House Theatre.

Hart House is open from 8.00 a.m. to 11.00 p.m. daily and meals are served in the Great Hall throughout the academic year. Members are entitled to full privileges of all rooms in the building between these hours and the use of the gymnasia, pool, showers and locker rooms until 6.30 p.m. each day, except Sunday, subject to the regulations of the Athletic Association.

The Library contains a good selection of books of general interest. These books must not be taken from the room.

Sunday Evening Concerts are given by the leading musicians of the city at 9 p.m. in the Great Hall on certain Sundays during the session and music recitals take place at 5 p.m. every Friday in the Music Room.

The Sketch Room is equipped with facilities for drawing and painting. Weekly drawing and painting classes are given by a qualified instructor and frequent exhibitions of pictures and lectures on Art are arranged.

A group of rooms is set apart for the use of the Faculty Union. A dining room and a common room are also reserved for Graudate Members. Six bed-rooms are available for the use of guests at a reasonable charge.

The Warden is entrusted with the general supervision of the whole house in co-operation with the following committees: House, Hall, Library, Music, Billiard, Sketch, Camera and Squash. These committees consist of two senior members, a graduate member, the Warden and a full representation of undergraduates. The undergraduates are elected annually by their fellow students. The Board of Stewards is the Senior Committee and has final control of the House, being directly responsible to the Board of Governors. It consists of the Warden (*ex officio* chairman) and representatives of the President of the University, the Board of Governors, the Faculty Union, the Athletic Association, the Graduate Members, the Student Christian Association, the Students' Administrative Council and the undergraduate secretaries of all Standing Committees.

All male undergraduates proceeding to a degree in the University are members of Hart House. The annual fee of $8.00 covers all fees in connection with Hart House and membership in the Athletic Association for the academic year (September to May). Membership Cards may be obtained at the Warden's Office on presentation of the Bursar's receipt for fees paid.

Hart House has no endowment whatsoever and is entirely dependent for its upkeep on the fees received from graduates and undergraduates and from various sources of revenue in the House itself.

Other male students in the University, or students in the affiliated or federated institutions receiving instruction in the University, may become members of Hart House on payment of the required fee at the Warden's office.

Graduates are entitled to the full privileges of Hart House on payment of an annual fee of $10.00. Out-of-town graduates may become members on payment of an annual fee of $2.50.

HART HOUSE THEATRE

Hart House Theatre is a Repertory Theatre existing to promote the interests of dramatic art in the widest sense. Its performances are open to members of the University and to the general public. The Theatre is operated by a Board of Syndics, who are responsible to the Governors of the University for its administration. It is the policy of the Syndics to permit the use of the Theatre by those dramatic societies within the University which are endeavouring to do serious work.

STUDENTS' ADMINISTRATIVE COUNCIL

The Students' Administrative Council has been entrusted by the Caput with supervision of the conduct of the students, and has power subject to the approval of the Caput to deal with violations of the regulations governing conduct.

Any student who may be convicted of having taken part in a parade or procession through the city which has not been authorized by the police authorities after application by the Executive of the Students' Administrative Council, will be severely disciplined.

UNIVERSITY OF TORONTO ATHLETIC ASSOCIATION

University Athletics for men are under the entire control of the University of Toronto Athletic Association, of which the executive body is the Athletic Directorate. This consists of:

The President of the University,
Two members of the faculty, appointed by the President,
Two graduates, appointed by the Athletic Advisory Board,
The Medical Director and the Financial Secretary (*ex officio*),
Five undergraduates, elected annually,
An undergraduate representative, appointed by the Executive of the Students' Administrative Council.

The Directorate alone has the power to sanction the use of the name "The University of Toronto" in connection with men's athletics, and no athletic event can be held in the University without its approval. It has control of the Athletic Field, the Gymnasium, the Swimming Pool, and other conveniences in connection with Athletics in Hart House, and is empowered by the Board of Governors to make the necessary arrangements to effect the carrying out of the University regulations requiring Physical Training for men.

THE GRADUATING DEPARTMENTS

The instruction in the various departments leading through the four years to the degrees of B.A.Sc. and B.Arch. is designed to give the student a thorough grounding in the fundamentals of the engineering and architectural professions, and in addition a sufficient familiarity with applications of the principles to make him immediately useful upon graduation.

With the exception of Architecture and Chemical Engineering the various courses are very similar in the first year. The succeeding years are devoted to the more particular work of the departments. In the fourth year specialization develops to the extent of various options.

The graduating courses are so designed, with many subjects common to the departments of the several years, that the student upon graduation will find himself sufficiently equipped in the various fundamentals to pursue readily his studies in branches other than the one in which he has graduated and indeed to be useful in them as well. The courses in this Faculty are not planned to make specialists; the process of specialization is more properly deferred until after graduation.

In the teaching of the fundamentals, instruction is not confined wholly to applied science. As the future engineer is vitally concerned with the development of the country, it is essential that he be instructed as well in certain fundamentals in economics, administration and business which, in conjunction with his scientific training, will enable him to develop his full value.

In some departments laboratory work in the fourth year consists of an investigation of some specific problem. In all cases the student's knowledge of the original literature and primary sources of information is extended, and he is given a very desirable and useful training in methods of research. In this way the undergraduate course is linked with the graduate course (see p. 110) and with the work of the School of Engineering Research (see p. 109).

On the following pages the courses of instruction in the different departments are set forth in detail. The time devoted to lectures and practical work is indicated as accurately as possible, but is subject to modification from time to time as occasion may require.

For further information concerning the opportunities available for graduates of this Faculty, reference should be made to the pamphlet issued by the Director of Extension Work and Publicity of the University entitled "Opportunities for Graduates in Applied Science."

1. DEPARTMENT OF CIVIL ENGINEERING

The course in Civil Engineering is designed to meet the needs of the students who intend to take up such work as Geodetic Surveying, Railway Engineering, Municipal Engineering, Sanitary Engineering, Highway Engineering, Structural Engineering, Hydraulic Engineering, and administrative work in connection with both Engineering and Industrial undertakings.

FIRST YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Geometrical Optics	185 (*b*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	2

SECOND YEAR

Subject	No.	Hours per week			
		First Team		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	286	...	..	..	..
Calculus	237	1	0	1	0
Spherical Trigonometry	239	1	0	0	0
Elementary Astronomy	71	1	0	1	0
Descriptive Geometry	162	1	0	1	0
Surveying	272, 273	1	9	1	0
Dynamics	3	1	0	1	0

CIVIL ENGINEERING—SECOND YEAR—Cont.

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Mechanics of Materials......	4	2	0	2	0
Engineering Chemistry......	93	1	0	0	0
Inorganic Chemistry	87A	1	0	0	0
Organic Chemistry..........	95	0	0	1	0
Metallurgy.................	241	0	0	1	0
Geology....................	195	0	0	2	0
Mineralogy.................	257,259	2	1	0	2
Hydrostatics...............	186	0	0	1	1
Heat.......................	187	1	1½	0	0
Photography................	188	1	1½	0	1½
Economics & Finance.......	123	1	0	1	0
Chemical Laboratory........	89	0	0	0	6
Engineering Drawing........	169	0	4½	0	13½
Physical Training..........	269	0	2	...	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Survey Camp............	275	...	...	...	...
Engineering Chemistry....	102	1	0	1	0
Theory of Structures......	6	2	0	2	0
Thermodynamics..........	223, 224	1	0	1	2
Hydraulics................	205, 206	2	0	2	3
Least Squares............	240	0	0	1	0
Practical Astronomy and Geodesy...............	72, 73	2	2	2	0
Descriptive Geometry.....	164	1	0	0	0
Surveying and Levelling...	274	1	0	1	0
Electricity...............	143, 144(*a*)	1	3	1	0
Stress Graphics...........	10	1	0	1	0
Cements and Concrete....	11	0	0	1	0
Engineering Geology......	197	1	0	1	0
Commercial Law.........	124	1	0	1	0
Public Speaking..........	133	1	0	0	0
Mechanics of Materials Laboratory............	9	0	3	0	0
Engineering Drawing......	173	0	15	0	12

CIVIL ENGINEERING—FOURTH YEAR

(a) Astronomy Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Survey Camp	275	..	..	..	..
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Astronomy	74, 76	2	23	2	0
Geodesy	75, 76	2	0	2	23
Photographic Surveying	191 (*b*)	1	2	0	0

FOURTH YEAR

(b) Municipal Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Hydraulics	211	1	3	0	0
Structural Design	17	1	0	0	0
Structural Design Drawing	179	0	0	0	5
Miscellaneous Structures	19	0	0	1	0
Hygiene and Bacteriology	82	1	0	1	6
Biology	81	0	5	0	0
Sanitary Chemistry	117	1	6	0	4
Sanitary Engineering	280	1	3	1	6
Highway Engineering	281	1	3	1	3
Municipal Seminar (including Town Planning)	282	0	3	0	3
Municipal Administration (including Civics)	132	1	0	1	0

CIVIL ENGINEERING—FOURTH YEAR—(c) Structural Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Physical Metallurgy	252	1	0	1	0
Structural Design	17, 18	2	0	1	0
Miscellaneous Structures	19	0	0	1	0
Mechanics of Materials Laboratory	13	0	3	0	6
Structural Design Drawing	178	0	22	0	22

FOURTH YEAR—(d) Hydraulic Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Hydraulics	207, 208, 209	3	10	3	10
Physical Metallurgy	252	1	0	1	0
Structural Design	17, 18	2	0	1	0
Miscellaneous Structures	19	0	0	1	0
Electrical Laboratory	144 (*a*)	0	0	0	3
Mechanics of Materials Laboratory	13	0	6	0	3
Structural Design Drawing	179	0	4	0	8

CIVIL ENGINEERING—FOURTH YEAR

(e) Railway Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Hydraulics	211	1	3	0	0
Special Geology	204	0	0	1	1½*
Physical Metallurgy	252	1	0	1	0
Electrical Laboratory	144 *(a)*	0	0	0	3
Motive Power	225	1	0	1	0
Railway and Miscellaneous Structures	20, 19	1	0	1	0
Railway Economics	131	2	0	2	0
Railway Location and Design	276	1	8	1	8
Mechanics of Materials Laboratory	13	0	3	0	6
Structural Design Drawing	179	0	6	0	6

*The ½ hour represents two excursions during the term.

2. DEPARTMENT OF MINING ENGINEERING

The course in Mining Engineering, which originated in 1878 as a course in Assaying and Mining Geology, is intended to serve as a preliminary training for those who expect to practice in some branch of Mining Engineering, such as exploration of mining areas and primary development, mine surveying, mining processes involving civil, mechanical, and electric work of underground workings, mining machinery and operation; milling and treatment of ores, assaying and other forms of analysis and research, and administrative work in connection with both Engineering and Industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Mineralogy	255, 258	2	1	0	3
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Mining Laboratory	50	0	0	0	3
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	2

MINING ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Notes	286	..	..	..	..
Vacation Work	69	..	..	..	..
Descriptive Geometry	162	1	0	1	0
Surveying	272, 273	1	6	1	0
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Inorganic Chemistry	87A	1	0	0	0
Inorganic Chemistry	87B	0	0	1	0
Organic Chemistry	95	0	0	1	0
Metallurgy	241	0	0	1	0
Geology	195	0	0	2	0
Mineralogy	260, 261	1	2	1	2
Mining	51, 53	1	3	0	0
Theory of Measurements	65	1	0	0	0
Steam Engines	216	1	0	0	0
Machine Design	234	1	0	1	3
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89, 90	0	6	0	6
Engineering Drawing	169	0	3	0	12
Physical Training	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Letters	68	..	..	..	..
Survey Camp	275	..	..	..	..
Geological Field Work	193	..	..	..	..
Engineering Chemistry	102	1	0	1	0
Theory of Structures	7	2	0	0	0
Hydraulics	205, 210	2	0	2	3
Analytical Chemistry	88	1	0	1	0
Electricity	143	1	0	1	0
Assaying	45, 46	1	3	0	3
Economic Geology	202, 203	1	0	3	2
Dynamic and Structural Geology	198	1	0	0	0
Ore Dressing	58, 59	1	3	1	3
Physics of Ore Dressing	64	1	0	1	0
Mining	54	1	0	1	0
Petrography	262	1	0	1	0
Metallurgy	243	1	0	1	0

MINING ENGINEERING—THIRD YEAR—Cont.

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Physical Metallurgy.......	244	0	0	2	0
Commercial Law..........	124	1	0	1	0
Petrography Laboratory ..	263	0	2	0	2
Introductory Research.....	66	0	0	0	3
Chemical Laboratory	99	0	0	0	9
Hydraulics Laboratory....	210	0	0	0	3
Engineering Drawing......	174	0	9	0	0

FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Letters..........	68	..	..	..	..
Thesis....................	67	0	7	0	10
Mine Cost Keeping and Management...........	56	1	0	1	0
Thermodynamics.........	223	1	0	1	0
Assaying.................	47, 48	0	0	1	3
Electrochemistry..........	107, 108	2	3	0	0
Geology, Pleistocene and Physiographic	194, 201	1	1	0	0
Geology, Precambrian.....	199	2	0	0	0
Geology, Mining.........	200	0	0	2	0
Metallurgy...............	247	1	0	1	6
Mining..................	55	1	0	1	0
Ore Dressing.............	60, 61	1	6	1	0
Engineering Economics....	125	0	0	1	0
Metallography............	251	0	0	0	3
Electrical Laboratory.....	144 (*b*)	0	3	0	0
Mechanics of Materials Laboratory............	9	0	0	0	3
Thermodynamics Lab'y...	224	0	3	0	0
Ceramics...............	254, 254(*a*), 254(*b*),254(*c*)	..	..	..	..

3. DEPARTMENT OF MECHANICAL ENGINEERING

The course in Mechanical Engineering is intended to serve as a preliminary training for those who intend to take up work connected with the design, manufacture, installation, or operation of machinery for the use of power as generated by steam, gas, oil, and water, and machinery and methods for the production, transportation, and handling of material, heating, ventilation, refrigeration, compressing of air, pumping of water, and all problems of a mechanical nature, and administrative work in connection with both Engineering and Industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Illuminating Engineering	185 (*a*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	2

MECHANICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	286	0	0	0	0
Calculus	237	1	0	1	0
Descriptive Geometry	162	1	0	1	0
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Engineering Chemistry	93	1	0	0	0
Inorganic Chemistry	87A	1	0	0	0
Organic Chemistry	95	0	0	1	0
Metallurgy	241	0	0	1	0
Hydrostatics	186	0	0	1	1½
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Steam Engines	216	1	0	1	0
Theory of Mechanism	230	2	1½	2	1½
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89	0	0	0	6
Engineering Drawing	170	0	13	0	11
Physical Training	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Theory of Structures	7	2	0	0	0
Thermodynamics	217, 219	2	3	2	3
Hydraulics	205, 206	2	0	2	3
Heat Engines	218	2	0	2	0
Mechanics of Machinery	231	1	0	1	0
Machine Design	233	2	4	2	10
Magnetism & Electricity	138, 140	1	3	1	3
Alternating Current	139	1	0	1	0
Physical Metallurgy	244	0	0	2	0
Compound Stress	10 (*a*)	1	0	0	0
Commercial Law	124	1	0	1	0
Mechanics of Materials Laboratory	9	0	0	0	3
Engineering Drawing	177	0	9	0	0

MECHANICAL ENGINEERING—FOURTH YEAR

(*a*) Power Plant Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	1*	0	1*
Engineering Economics	125	0	0	1	0
Structural Design	17, 18, 180	2	3	0	3
Electrical Laboratory	144 (*c*)	0	0	0	3
Heat Treatment of Iron and Steel	253	1	0	1	0
Machine Design	235	2	7	1	6
Thermodynamics and Heat Engines	220, 221, 222	3	9	3	9
Hydraulics	207, 208, 209	3	8	3	8

*Thesis time to be taken from Thermodynamics, Hydraulics or Machine Design laboratories as arranged during the session.

FOURTH YEAR

(*b*) Water Power Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	1*	0	1*
Engineering Economics	125	0	0	1	0
Structural Design	17, 18, 180	2	3	0	3
Electrical Laboratory	144 (*c*)	0	0	0	3
Heat Treatment of Iron and Steel	253	1	0	1	0
Machine Design	235	2	5	1	7
Hydraulics	207, 208, 209	3	11	3	11
Mechanics of Materials	13	0	6	0	3
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Reinforced Concrete Design	181	0	3	0	3

*Thesis time to be taken from Hydraulics or Machine Design Laboratories as arranged during the session.

MECHANICAL ENGINEERING—FOURTH YEAR

(*c*) Industrial Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	1*	0	1*
Engineering Economics	125	0	0	1	0
Structural Design	17, 18, 180	2	3	0	3
Electrical Laboratory	144 (*c*)	0	0	0	3
Heat Treatment of Iron and Steel	253	1	0	1	0
Heating, Ventilation and Refrigeration	226, 227, 228	1	3	1	3
Machine Design	235	2	6	1	8
Thermodynamics and Heat Engines	220, 221, 222	3	6	3	12
Hydraulics	209, 212	1	9	1	0
Industrial Management	130	1	0	1	0

*Thesis time to be taken from Thermodynamics, Hydraulics or Machine Design laboratories as arranged during the session.

4. DEPARTMENT OF ARCHITECTURE

The instruction in this department is arranged mainly to lay a broad foundation for the subsequent professional life of its graduates The curriculum is based on the belief that an architect should have an education in liberal studies, that he should understand and appreciate the other arts in their relation to architecture, and that his training in design should teach him to regard building construction as an expression of his art rather than as an end in itself With this object in view, the course in Architecture, which was originally derived from the Engineering courses, has been gradually broadened out to include an elementary training in the sister arts of painting and scultpure, and also courses in French and English.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	161	1	0	1	0
Statics	1	2	0	2	0
Building Measurements	37	1	2	1	0
Elements of Architectural Form	28	1	0	1	0
History of Architecture	25	1	3	1	0
Technical English	122(*a*)	1	0	1	0
French	266	2	0	2	0
Modelling	36	0	2	0	2
Freehand Drawing and Water Colour Painting	35	0	3	0	3
Architectural Design Engineering Drawing	31 167	0	14	0	18
Physical Training	269	0	2	0	2

Architecture—Second Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work.........	286	..	..	..	..
Descriptive Geometry...	163	1	0	1	0
Mechanics of Materials..	5	2	0	2	0
Theory of Architectural Planning............	32	1	0	1	0
History of Architecture..	25(*a*)	1	0	1	0
History of Ornament....	29	1	0	1	0
Illumination............	189	1	1½	1	1½
Economics and Finance..	123	1	0	1	0
Technical English	122(*b*)	1	0	1	0
French................	266	2	0	2	0
Modelling..............	36(*a*)	0	2	0	2
Freehand Drawing......	35(*a*)	0	3	0	3
Architectural Design.... Engineering Drawing...	31(*a*) 171	0	17	0	17
Physical Training.......	269	0	2	0	2

Third Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work.........	287	..	..	..	..
Structural Design.......	8	2	0	2	0
Acoustics	190	1	1½	1	0
Building Materials......	38	2	0	2	0
History of Architecture..	25(*b*)	1	0	1	0
History of Fine Art.....	30	1	0	1	0
Architectural Composition.................	33	1	0	1	0
Garden Design.........	27	0	0	1	0
Commercial Law........	124	1	0	1	0
French................	266	1	0	1	0
Modelling..............	36(*b*)	0	2	0	2
Freehand Drawing and Water Colour Painting	35(*b*)	0	3	0	3
Architectural Design.... Engineering Drawing...	31(*b*) 175	0	18	0	18

ARCHITECTURE—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work..........	288	..	..	..	..
Thesis..................	286	0	3	0	3
Contracts and Specifications................	127	0	0	1	0
Architectural Aspects of of Town Planning....	34	0	0	1	0
Advanced Architectural Programmes.........	26	1	0	1	0
Garden Design.........	27(*a*)	0	0	1	0
Structural Design.......	16	1	3	1	3
Heating and Ventilating.	40	1	0	1	0
Sanitary Science........	39	1	0	1	0
Drawing from Life......	35(*c*)	0	3	0	3
Modelling from Life.....	36(*c*)	0	2	0	2
AND ONE OF:					
Architectural Design..	31(*c*)	2	24	2	22
Architectural Engineering	31(*d*), 16	4	22	3	20

6. DEPARTMENT OF CHEMICAL ENGINEERING

The course is designed to give the student a thorough training in Chemistry and its application to industry, as well as a general knowledge of the elements of thermodynamics, hydraulics, machine design, structural design, electricity and metallurgy. A preliminary training of this nature with subsequent practical experience will enable him to undertake the design and construction and also the operation and management of the plant required in such branches of chemical industry as are concerned with the production of chemical and pharmaceutical products, petroleum and its products, rubber goods, leather and glue, soap, meat products, food-stuffs, vegetable and animal oils, sugar, pulp and paper, illuminating gas, coal tar and wood distillates, paints and varnishes, explosives, dyes, glass, portland cement, metals and their alloys, electrochemical products, fermentation products, printers' inks, fertilizers, ceramic and building materials, etc.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Geometrical Optics	185(*b*)	1	2	1	2
Technical English	122(*a*)	1	0	1	0
German	267	2	0	2	0
Business	121	0	0	1	0
Mineralogy Laboratory	256	0	2	0	1
Biological Laboratory	80	0	6	0	0
Chemical Laboratory	86	0	0	0	12
Engineering Drawing	168	0	8	0	0
Physical Training	269	0	2	0	2

CHEMICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	286				
Calculus	237	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Engineering Chemistry	93	1	0	0	0
Organic Chemistry	96	2	0	2	0
Metallurgy	241	0	0	1	0
Hydrostatics	186	0	0	1	1
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Industrial Chemistry	94	1	0	1	0
Physical Chemistry	98	2	0	2	0
Inorganic Chemistry	87A	1	0	0	0
Inorganic Chemistry	87B	0	0	1	0
German	267	1	0	1	0
Economics and Finance	123	1	0	1	0
Chemical Laboratory	92, 97	0	10	0	12
Engineering Drawing	172	0	7	0	3
Physical Training	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Theory of Structures	7	2	0	0	0
Thermodynamics	217, 224	2	0	2	2
Hydraulics	205, 206	2	0	2	1
Metallurgy	243	1	0	1	0
Physical Metallurgy	244	0	0	2	0
Assaying Laboratory	49	0	3	0	0
Analytical Chemistry	88	1	0	1	0
Electrochemistry	107, 108	2	3	0	0
Industrial Chemistry	103	1	0	1	0
Organic Chemistry	105	2	0	2	0
Chemical Plant	104	1	0	1	0
German	267	1	0	1	0
Commercial Law	124	1	0	1	0
Chemical Laboratory	100, 106	0	7	0	17
Engineering Drawing	177	0	6	0	0
Electrical Laboratory	144 (*d*)	0	0	0	3

CHEMICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285				
Industrial Management	130	1	0	1	0
Machine Design	234	1	0	1	3
German	267	1	0	1	0
or Spanish	268	1	0	1	0
Inorganic Chemistry	109	2	0	2	0
Organic Chemistry	110, 111	1	17	1	0
AND ONE OF:					
Electrochemistry	114, 115	2	*	2	*
Industrial Chemistry	112, 113	1	*	1	*
Sanitary and Forensic Chemistry and Bacteriology	116	1	*	1	*
Metallurgy	247	1	*	1	*
Physical Metallurgy	250	1	*	1	*
Ore Dressing	62, 63	1	0	1	6
Zymology	283	*	*	*	*
Ceramics	254, 254(*a*), 254(*b*), 254(*c*)	8	8	8	8

*All time not otherwise allotted must be spent in the various laboratories in the proportions assigned by the Department.

7 DEPARTMENT OF ELECTRICAL ENGINEERING

The course in electrical engineering is designed for those who are looking forward to work in connection with the design, manufacture, installation, or operation of electrical machinery and equipment for the generation, transmission, and utilization of power, for domestic and industrial purposes including its many applications to problems of intercommunication in connection with railway, telephone, telegraph, or radio equipment, to work in connection with electrochemical processes, and to administrative work in connection with both engineering and industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Illuminating Engineering	185 (*a*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	0

ELECTRICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	286				
Calculus	237	1	0	1	0
Descriptive Geometry	162	1	0	1	0
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Engineering Chemistry	93	1	0	0	0
Organic Chemistry	95	0	0	1	0
Inorganic Chemistry	87A	1	0	0	0
Hydrostatics	186	0	0	1	1½
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Steam Engines	216	1	0	1	0
Theory of Mechanism	230	2	1½	2	1½
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89	0	6	0	0
Engineering Drawing	170	0	12	0	12
Physical Training	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Thermodynamics	217, 219	2	3	2	1
Hydraulics	205, 206	2	0	2	1
Heat Engines	218	1	0	1	0
Mechanics of Machinery	231	1	0	1	0
Machine Design	233	2	4½	2	4½
Alternating Current	139	1	0	2	0
Physical Metallurgy	244	0	0	2	0
Electrochemistry	107, 108	2	3	0	0
Magnetism and Electricity	138	2	0	1	0
Electrical Design	141, 142	1	3	1	3
Commercial Law	124	1	0	1	0
Electrical Laboratory	140	0	6	0	6

ELECTRICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285				
Engineering Economics	125	0	0	1	0
Industrial Management	130	1	0	1	0
Applied Electricity	145, 146	4	20	4	19
AND ONE OF:					
Hydraulics	207, 208, 209	3	9	3	10
Thermodynamics	220, 221, 222	3	9	3	9
Electrochemistry	114, 115	2	9	2	9
OR:					
Radiotelegraphy	147, 148	2	9	2	9
and					
Acoustics	191(*a*)	1	1	0	0
OR					
Illumination Design	192	1	6	1	6

8. DEPARTMENT OF METALLURGICAL ENGINEERING

This course is designed for those who intend to take up work in connection with the production, treatment and working of metals for the purposes of industry; or the design, construction, or operation of metallurgical plants including smelters, furnaces, foundries, refineries, and lixiviation works; and administrative work in connection with both Engineering and Industrial undertakings.

An optional course in this Department is provided in the Third and Fourth years for those students who wish to become Ceramic Engineers. Ceramic plant experience, approved by the Department, will be necessary before the student will be given his degree. Students who have successfully completed their first and second years in any department of engineering will be allowed to transfer to the Department of Metallurgical Engineering for pursuing this option.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Elementary Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Technical English	122(*a*)	1	0	1	0
Business	121	0	0	1	0
Mineralogy Laboratory	256	0	2	0	1
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	2

SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Chemistry	87A, 87B, 91	1	14	1	13
Metallurgy	241, 242	1	0	2	0
Geology and Ore Deposits	196	1	1	1	1
Steam Engines	216	1	0	0	0
Electricity	136, 137	2	3	2	3
Spanish	268	1	0	1	0
Economics and Finance	123	1	0	1	0
Engineering Drawing	172	0	3	0	6
Physical Training	269	0	2	0	2

METALLURGICAL ENGINEERING—THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Cements and Concrete	11	0	0	1	0
Heat Engines	218	1	0	1	0
Electricity	143, 144 (*e*)	1	3	1	3
Electrochemistry	107, 108	2	3	0	0
Assaying	45, 46	1	3	0	3
Ore Dressing	58, 59	1	3	1	3
Mining	51, 52	1	0	1	0
Metallurgy	245	2	3	1	6
Physical Metallurgy	246	1	3	1	0
Machine Design	234	1	0	1	3
Commercial Law	124	1	0	1	0
Chemical Laboratory	101	0	0	0	6
Engineering Drawing	182	0	3	0	0
Analytical Chemistry	88	1	0	1	0

METALLURGICAL ENGINEERING—THIRD YEAR

(*a*) Ceramic Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Physical Chemistry	98	2	0	2	0
Engineering Geology	197	1	0	1	0
Theory of Structures	7	2	0	0	0
Cements and Concrete	11	0	0	1	0
Commercial Law	124	1	0	1	0
Engineering Drawing	177	0	6	0	6
Thermodynamics	223, 224	1	0	1	2
Machine Design	234	1	0	1	0
Mineralogy	255, 258	2	1	0	0
Petrography	260	1	0	1	0
Ceramics (General and Manufacturing)	254(*a*)	4	0	2	0
Glazes	254(*b*)	0	0	2	0
Ceramic Calculations	254(*c*)	0	0	1	0
Ceramic Laboratory	254(*d*)	0	6	0	6
Clay Testing	254(*e*)	0	6	0	6

FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	6	0	6
Engineering Economics	125	0	0	1	0
Contracts and Specifications	127	0	0	1	0
Plant Management	129	0	0	1	0
Thermodynamics	223	1	0	1	0
Assaying	47, 48	0	0	1	3
Ore Dressing	60, 61	1	6	1	0
Electrochemistry	114, 115	2	3	2	3
Metallurgy	249	1	0	1	0
Metallurgy Problems	248	2	4	2	4
Physical Metallurgy	250	1	3	1	3
Thermodynamic Laboratory	224	0	3	0	0
Hydraulic Laboratory	210	0	0	0	3
Ceramics	254, 254(*a*), 254(*b*), 254(*c*)	..	..	..	..

METALLURGICAL ENGINEERING—FOURTH YEAR

(*a*) Ceramic Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Contracts and Specifications	127	0	0	1	0
Plant Management	129	0	0	1	0
Reinforced Concrete	15	1	0	1	0
Structural Design	18	1	0	0	0
Silicate Chemistry	116(*a*)	0	0	2	0
Pleistocene Geology	194, 201	1	3	1	0
Petrography	262, 263	1	2	1	2
Structural Design Drawing	183	0	6	0	6
Refractories and Ceramic bodies	254(*f*)	2	0	0	0
Glass and enameled iron	254(*g*)	0	0	2	0
Ceramic products and specifications	254(*h*)	1	0	0	0
Ceramic Laboratory	254(*i*)	0	9	0	9
Thesis	285	0	10	0	10

OUTLINE OF LECTURE AND LABORATORY COURSES PROCEEDING TO BACHELOR DEGREES

On the following pages the courses of instruction are set forth in detail. The time devoted to the various subjects, both for lectures and practical work, is indicated as accurately as possible; the hours, however, shown in the prescriptive schedules on pages 40 to 61 will govern.

The curriculum as printed is intended to cover the prescription for the current year only and does not imply the right of a student to have the course unchanged during any subsequent year of his attendance.

The courses are designed to give the student a sound training in the fundamental scientific principles on which the various branches of engineering are based. The instruction is given by means of lectures and practical work in the laboratories, the drafting rooms and the field.

The courses in the first two years are devoted to the theoretical and essential scientific requirements of the engineering profession as a whole, with an introduction in a few cases of the practical application of these to engineering problems.

In the third and fourth years, the subjects of the former years are continued with particular attention paid to their application to modern engineering practice in the problems of design, erection, installation and operation peculiar to the several branches of the profession.

APPLIED MECHANICS

1. *Statics:*—T. R. Loudon.

All Departments, I Year; 2 hours per week, both terms.

This course of lectures deals with forces in a single plane, and concerns chiefly the calculation of tension, compression and shearing stresses in frame structures and solid beams.

2. *Dynamics:*—T. R. Loudon.

Departments 1, 2, 3, 6, 7, 8, I Year; 2 hours per week; both terms.

This course of lectures deals with bodies having motion of translation in one plane; also with relative motion, momentum, work and energy.

Text Book:—Tutorial Dynamics—Briggs and Bryan.

3. *Dynamics of Rotation:*—W. J. Loudon.

Departments 1, 2, 3, 7, 8, II Year; 1 hour per week; both terms.

This course covers angular motion, including moments of inertia, simple harmonic motion, the pendulum, centres of mass, suspension and percussion, the simple theory of the fly-wheel and the governor.

Text Book:—Dynamics of Rotation—Loudon.

4. *Mechanics of Materials:*—P. Gillespie.

Departments 1, 2, 3, 6, 7, 8, II Year; 2 hours per week; both terms.

In this course the strength and elasticity of materials are mathematically treated. The stresses in such elements of structures as the tie rod, the beam, the strut and the member subjected to shear are investigated and the elementary principles of design established. In the lecture and drafting rooms through numerous problems involving the design of simple beams, columns, riveted connections, etc., these principles are exemplified. The work includes also the discussion of eccentric loading, suddenly applied loads and repeated stresses.

Reference Book:—Mechanics of Materials—Merriman.

5. *Mechanics of Materials:*—T. R. Loudon.

Department 4, II Year; 2 hours per week; both terms.

This course deals with the mathematical consideration of stress and elasticity. Among the problems taken up are the consideration of riveted joints, theory of simple and continuous beams, the theory of columns and simple column footings.

Text:—Strength of Materials—Boyd.

6. *Theory of Structures:*—C. R. Young.

Department 1, III Year; 2 hours per week; both terms.

The work of the first term comprises a thorough discussion of combined stresses, columns, restrained, continuous and trussed beams, multiple section and box girders, and plate girders. A number of designs of structures and structural details are worked out in the class and drafting rooms.

The second term is given chiefly to the design of a riveted truss highway span and a riveted truss railway span, the complete designs being made in the lecture and drafting rooms.

Text Books:—Modern Framed Structures, Part III—Johnson, Bryan and Turneaure; Structural Members and Connections—Hool and Kinne; Structural Problems—Young; Carnegie Pocket Companion; Cambria Steel.

7. *Theory of Structures:*—C. R. Young.

Departments 2, 3, 6 and 8(*a*), III Year; 2 hours per week; first term.

The work is practically the same as that for Department I in the first term.

8. *Structural Design:*—T. R. Loudon, W. J. T. Wright.

Department 4, III Year; 2 hours per week; both terms.

During the first term, the economics of the design of floor systems in timber and structural steel are discussed. The design of masonry piers, structural steel and timber columns is also gone into in the first term.

The second term is taken up in the discussion of the design of roof trusses and an introduction to reinforced concrete.

9. *Mechanics of Materials:*—P. Gillespie.

Departments 1, 3, III Year; Department 2, IV Year; 3 hours per week; one term.

This laboratory course is intended to give the student an introduction to the experimental study of the strength and elasticity of materials. It is intended that he shall acquire some familiarity with the construction and operation of testing machines and with the properties of the ordinary building materials.

Reference:—Laboratory Instruction Sheets, Department of Civil Engineering; Municipal and Structural.

10. *Stress Graphics:*—T. R. Loudon.

Department 1, III Year; one hour per week; both terms.

This course of lectures deals mainly with graphic methods of solving stresses in framed structures. The construction of Shearing Force diagrams, Bending Moment diagrams and Influence Lines is also dealt with.

Text Book:—Graphic Analysis—Wolfe.

10(*a*). *Compound Stress:*—T. R. Loudon.

Department 3, III Year; one hour per week, first term.

This course deals mainly with the discussion of methods determining the stress conditions in bodies subjected to compound stress. Both analytical and graphical methods of analysis are discussed.

11. *Cements and Concrete:*—P. Gillespie.

Departments, 1, 8, and 8 (a) III Year; one hour per week; second term.

The manufacture, testing and use of Portland cement and the fundamentals of the theory of reinforced concrete are discussed in this course of lectures.

12. *Theory of Structures:*—C. R. Young.

Departments 1 (c), (d), (e), IV Year; 2 hours per week; both terms.

The work comprised in this course of lectures concerns arches, suspension bridges, cantilever bridges, swing bridges, deflections, and secondary stresses. Problems based on the lectures are worked out in the drafting rooms.

Reference Books:—Modern Framed Structures, Part II—Johnson, Bryan and Turneaure; Theory of Structures—Spofford.

13. *Mechanics of Materials:*—P. Gillespie.

Departments 1 (c), (d) and (e), 3 (b), IV Year; a laboratory course of 3 hours per week one term and 6 hours per week the other term.

This course of experiments is intended to give the student practice in investigating the elastic and physical properties of iron, steel, concrete, timber, etc., and in the use of instruments of precision designed for that purpose.

Reference Book:—Materials of Construction—Johnson.

14. *Foundations, Retaining Walls and Dams:*—P. Gillespie, W. J. Smither.

Department 1 (b), (c), (d) and (e), IV Year; Department 3, IV Year, Option (b); 1 hour per week; both terms.

This course of lectures is devoted to the design of the structures mentioned. Preparatory to the discussion of the practical aspects of the subjects, and in order to gain familiarity with the fundamental principles involved, a part of the first term is given over to the consideration of the theory of compound stress. The most approved forms of construction of retaining walls, footings, abutments, piers and dams are then described, and typical designs are worked out in the class and drafting rooms.

Some attention is also given to the principles of formula charting.

Text Books and Books of Reference:—Retaining Walls for Earth—M. A. Howe; Walls, Bins and Grain Elevators—M. S. Ketchum; A Treatise on Masonry Construction—I. O. Baker; Design and Construction of Dams—E. Wegmann.

15. *Reinforced Concrete:*—P. Gillespie.

Department 1 (b), (c), (d) and (e); Department 3 (b) and Department 8 (a), IV Year; 1 hour per week; both terms.

The theory of the strength of reinforced concrete elements including the beam, the slab, the T-beam, the column and the footing, is continued in this course.

The analysis of the monolithic arch by the elastic theory is discussed, and the student is required in the drafting room to apply his knowledge to the design of simple structures.

Reference books:—Principles of Reinforced Concrete Construction—Turneaure and Maurer; Reinforced Concrete Construction, Vol. I—Hool.

16. *Structural Design:*—T. R. Loudon.

Department 4, IV Year; 1 hour lecture and 3 hours laboratory per week; both terms.

During this course of lectures, the economics of the design of buildings in reinforced concrete and steel are discussed. This course of lectures is supplemented by the actual designing of buildings in the drafting room.

Text:—Principles of Reinforced Concrete—Turneaure and Maurer.

17. *Structural Design:*—C. R. Young, W. J. Smither.

Department 1_c, 1_d, IV Year; 1 hour per week; both terms.

Department 1_b and 3, IV Year; 1 hour per week; first term.

This course of lectures is devoted to the problems connected with the structural design of buildings of timber, steel and reinforced concrete. The various structural elements such as the floors, columns, footings, walls and wind bracing, are fully discussed, and portions of typical buildings are designed in the class and drafting rooms.

Text Books:—Handbook of Building Construction—Hool and Johnson; Architects' and Builders' Handbook—Kidder—Nolan.

18. *Structural Design:*—C. R. Young, W. J. Smither.

Departments 1_c, 1_d, 3 and 8 (a), IV Year; 1 hour per week; first term.

Consideration is given in this course to the various types of mill buildings, to the conditions governing their choice and to the details of construction in different materials. Designs of portions of mill buildings are worked out in the class and drafting rooms.

Text Books:—Steel Mill Buildings—Ketchum. Mill Buildings—Tyrrell.

19. *Miscellaneous Structures:*—W. J. Smither.

Department 1 (b), (c), (d) and (e), IV Year; 1 hour per week; second term.

In this course of lectures the application of theoretical principles to the design of a variety of structures is made. Among those structures discussed are transmission line towers, elevated tanks and their supporting towers, standpipes, large pressure pipes, sewers, culverts, small highway bridges, sub-surface tanks and tall chimneys. Whenever possible the lecture work is followed up by designs in the drafting room.

20. *Railway Structures:*—C. R. Young.
Department 1_e, IV Year; 1 hour per week; first term.
A course of lectures with exercises covering alternative bridge layouts with comparative estimates of costs, temporary and permanent trestles, tunnels, tunnels vs. bridges, buildings, turntables, snow sheds and shelters.

ARCHITECTURE

25. *History of Architecture:*—H. H. Madill, E. R. Arthur.
Department 4, I Year; 1 hour per week; both terms.
In this course the development of architecture is traced from Prehistoric times to the Early Romanesque.

25*a*. *History of Architecture:*—H. H. Madill, E. R. Arthur.
Department 4, II Year; 1 hour per week; both terms.
In this course the development of architecture is traced from the Romanesque Period to the present time.

25*b*. *History of Architecture:*—H. H. Madill, E. R. Arthur.
Department 4, III Year; 1 hour per week; both terms.
In this course the work of the Renaissance in Italy, France and England is taken in greater detail than was possible in the broad field covered in the previous year.

26. *Advanced Architectural Programmes:*—H. H. Madill, E. R. Arthur.
Department 4, IV Year; 1 hour per week; both terms.
In this course of lectures the principles underlying the planning of such large buildings as Churches, Departmental Stores, Theatres, Schools, Railway Stations, etc., are discussed in detail.

27. *Garden Design:*—H. B. Dunington-Grubb.
Department 4, III Year.
In this course the historical development of Garden Design is traced from earliest times; the study of sites; the influence of topography, orientation, access, etc., on the problems of design; site planning; the location of buildings; the solution of an actual problem on a typical site.

27*a*. *Garden Design:*—H. B. Dunington-Grubb.
Department 4; IV Year.
The work of the previous year is continued and a problem is set in the studio involving principles of both architectural and garden design.

28. *Elements of Architectural Form:*—E. R. Arthur.
Department 4, I Year; 1 hour per week; both terms.
Lectures on the Five Orders of Architecture, their affiliated forms and other elements used in design. This course is preliminary to the lectures given in the II Year on the Theory of Architectural Planning.

29. *Architectural Ornament:*—H. H. Madill.
Department 4, II Year; 1 hour per week; both terms.
In this course the development of Ornament is traced from the beginning through Egyptian, Assyrian, Grecian, Roman, Byzantine, Romanesque, Gothic and Renaissance styles. An attempt is made to analyze ornament of the best periods and to systematize the principles followed in form and colour.

30. *History of Fine Art:*—C. W. Jefferys, F. Coates.
Department 4, III Year; 1 hour per week; both terms.
The course consists of an outline of the history and development of painting and of the minor pictorial arts from the earliest time until the present day; followed by an outline of the history and development of the different eras of sculpture ranging from the primitive to the present day.

31. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, I Year.
This comprises work done in the Studio, including lettering, the drawing and rendering of the Orders and such elementary motives as a door, a window, etc.
This is followed by a drawing in which the Classic orders and ornament taken from a particular building are arranged in the form of a composition, and by an elementary problem in design.

31*a*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, II Year.
This course is given by means of individual instruction in the studio and by criticisms of the solutions of different problems set during the year. It is in this course that the student begins the serious study of design; continued practice in architectural drawing and rendering affords the training necessary to make of the student a proficient draughtsman.

31*b*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, III Year.
This course is given by individual instruction in the studio and by criticisms of solutions of problems set during the year. The greater part of the course is devoted to problems in design and forms a continuation of the course given in the preceding year.

31*c*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, IV Year.
This course is a continuation of the work of the preceding years, being given by individual instruction in the studio and criticisms of the solution of problems set during the year.
During the second term architectural working drawings of a building designed by the student are prepared in the studio.

31*d*. *Architectural Design:*—T. R. Loudon, H. H. Madill, E. R. Arthur.
Department 4, IV Year; Architectural Engineering Option.
In this course the design and preparation of working drawings and structural details of work of a monumental character is carried on in the studio.

32. *Theory of Architectural Planning:*—E. R. Arthur.
Department 4, II Year.
In this course special attention is given to the elements and general principles of architectural planning.

33. *Architectural Composition:*—E. R. Arthur.
Department 4, III Year.
This course consists of a series of lectures on the theory of architectural design, the analysis of composition, proportion, scale, etc.

34. *Architectural Aspects of Town Planning:*—E. R. Arthur.
Department 4, IV Year; 1 hour per week; second term.
In this course of lectures the Historical Development of Town Planning is traced with particular reference to the Axial Planning of the Renaissance, Public Squares, the Grouping of Buildings and the placing of Monuments.

35. *Freehand Drawing and Water Colour Painting:*—C. W. Jefferys.
Department 4, I Year; 3 hours per week; both terms.
Drawing from still life objects. Primary free hand perspective. Primary pencil, charcoal, and pen and ink rendering.

35*a*. Department 4, II Year; 3 hours per week; both terms.
Drawing and monochrome painting from still life.
Drawing from the cast.
Pencil, pen and ink, and monochrome rendering.
Primary water colour.
Drawing from landscape and natural objects.

35*b*. Department 4, III Year; 3 hours per week; both terms.
Drawing from the cast.
Water colour from still life. Water colour rendering.
Drawing from landscape and natural objects.
Students who are sufficiently advanced are admitted to the Fourth Year Life Drawing Class.

35*c*. Department 4, IV Year; 3 hours per week; both terms.
Water colour from still life and from landscape.
Drawing from life.
Water colour rendering.

36. *Modelling:*—Frederick Coates.
Department 4, I Year; 2 hours per week; both terms.
The Orders. Synopsis of styles.

36*a*. Department 4, II Year; 2 hours per week; both terms.
Problems in figures and in relation to architecture.

36*b*. Department 4, III Year; 2 hours per week; both terms.
Styles continued.
Problems, combination of figure, ornament and architecture and their relative values.

36*c*. Department 4, IV Year; 2 hours per week; both terms.
Modelling from life.
Anatomy.
Composition of groups.

37. *Building Measurement:*—C. H. C. Wright.
Department 4, 1 Year; 1 hour per week; both terms.
In this course of lectures the principles of measurements and mensuration with special reference to buildings will be discussed. With this is combined practice in measurements of existing buildings, quantities, etc.

38. *Building Materials:*—C. H. C. Wright.
Department 4, III Year; 2 hours per week; both terms.
The structural and aesthetic value of the various building materials.

39. *Sanitary Science:*—H. H. Madill.
Department 4, IV Year; 1 hour per week; both terms.
Modern plumbing, its design and installation, drainage, sewerage disposal and water supply.

40. *Heating and Ventilating:*—C. H. C. Wright.
Department 4, IV Year; 1 hour per week; both terms.
The design of different systems, where they should be used, heating specifications, etc.

ASSAYING, MINING AND ORE DRESSING

The work in Mining is directed more to the development of the proper attitude of mind towards mining problems than to the teaching of actual mining methods.

The teaching of Assaying has a two-fold function. The first is to give the student a working knowledge of the practice of the art, so that he can earn money as an assayer on graduation and use this as a stepping-stone to other positions. The second is to use the assaying laboratories

for the training of the students in certain important phases of Engineering methods. The size of the apparatus, the completeness of the processes in short intervals of time, the extreme accuracy of results when so desired, the relation of the extent of error to time and method, the similarity of the academic laboratory to the field laboratory, all these permit an unrivalled opportunity for driving home much broad Engineering philosophy. The assaying processes and apparatus lend themselves peculiarly well for the development of a proper perspective in regard to errors and accuracy in measurements.

The study of Ore Dressing, when accompanied by laboratory work in a well equipped ore dressing laboratory, is one of the most important of the Mining Engineering subjects. Not only is the mechanical treatment of ores a very important branch of Mining Engineering, but the mental processes involved in a study of the fundamental principles underlying the art and the compromise necessary for field practice form one of the best fields for the development of Engineering philosophy. From these points of view the ore dressing laboratory is exceptionally well equipped.

45. *Assaying:*—J. T. King.

Departments 2 and 8, III Year; 1 hour per week; first term.

A first course of lectures on the theory of fire assaying. Emphasis is laid not only on the chemical and metallurgical principles involved, but upon the errors inherent in operators as well as in methods.

Text Book:—Manual of Fire Assaying—Fulton.

46. *Assaying:*—J. T. King.

Departments 2 and 8, III Year; 3 hours per week; both terms.

A laboratory course in the determination of the precious metals in ores, milling and metallurgical products. Scorification and crucible assays of ores and products, pure and impure, fluxes, slags and solutions. Buckboard practice, ores with metallics. Copper and lead by electrolysis. Students are expected to do their later assays with despatch and a reasonable degree of accuracy. Neatness of work is required.

47. *Assaying:*—J. T. King.

Departments 2 and 8, IV Year; 1 hour lecture per week; second term.

A continuation of course 45. Complex ores. Combination assays. The sampling and assay of bullion. The Platinum group metals. Checks and corrections.

48. *Assaying:*—J. T. King.

Departments 2 and 8, IV Year; 3 hours per week; second term.

An advanced laboratory course in which some of the methods of course 47 are used.

49. *Assaying:*—J. T. King.
Department 6, III Year; 3 hours per week; first term.
An introductory laboratory course for Chemical Engineers. Some lecture instruction is given. An abbreviation of courses 45 and 46.

50. *Mining:*—H. E. T. Haultain and F. C. Dyer.
Department 2, I Year; 3 hours per week; second term.
A laboratory course, including some lectures, being an introduction to certain mining and milling machinery and methods.

51. *Mining:*—H. E. T. Haultain.
Department 2, II Year and Department 8, III Year; 1 hour per week; first term.
An introductory course of lectures.

52. *Mining:*—H. E. T. Haultain.
Department 8, III Year; 1 hour per week; second term.
An extension of No. 51.

53. *Mining:*—F. C. Dyer.
Department 2, II Year; 3 hours per week; first term.
Continuation of No. 50. Rock drills, sampling methods, use of explosives.

54. *Mining:*—H. E. T. Haultain and F. C. Dyer.
Department 2, III Year; 1 hour per week; both terms.
Principles of mining.

55. *Mining:*—H. E. T. Haultain.
Department 2, IV Year; 1 hour per week; both terms.
Special problems, estimates, reports.

56. *Mine Cost Keeping and Management:*—H. E. T. Haultain.
Department 2, IV Year; 1 hour per week; both terms.
One of the fundamental features that must not be lost sight of by the Mining Engineer is, that his work is designed primarily for purposes of financial profit. This course of lectures deals with details from this point of view. The total cost of a ton of ore requiring as it does an understanding of the problems of amortization, is first dealt with in a broad way. Then are considered various problems of cost keeping, leading on to problems of time and motion study which are essential to the development of the fine points of the art in any particular mining problem. The latter part of the course deals with problems of management, the relations of members of the staff to each other, and the relations of the staff to labour.

58. *Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Departments 2 and 8, III Year; 1 hour per week; both terms.
The general principles of Ore dressing.

59. *Ore Dressing:*—F. C. Dyer.
Departments 2 and 8, III Year; 3 hours per week; both terms.
Work with crushing machinery, principles of crushing and grading screen analyses, concentration with gravity separation apparatus, etc.

60. *Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Departments 2 and 8, IV Year; 1 hour per week; both terms.
No. 58 continued, study of flow sheets and special problems.

61. *Ore Dressing:*—F. C. Dyer.
Departments 2 and 8, IV Year; 6 continuous hours per week; first term.
Advanced work with ore dressing appliances, ore testing and check mill runs.

62. *Ore Dressing:*—F. C. Dyer.
Department 6*k*, IV Year; 1 hour per week; both terms.
General principles of ore dressing.

63. *Ore Dressing:*—F. C. Dyer.
Department 6*k*, IV Year; 1 period of 6 hours per week; second term.
Principles of sampling, crushing and grading, screen analyses, concentration with gravity separation apparatus, flotation, ore testing, etc.

64. *Physics of Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Department 2, III Year; 1 hour per week; both terms.
Ore dressing methods involve a study of the laws governing the phenomena of surface tension, capillarity and colloidal solutions, in addition to those of hydrostatics and certain phases of hydraulics. This is embodied in a special course of lectures in conjunction with laboratory work in the Ore dressing laboratory.

65. *Theory of Measurement:*—H. E. T. Haultain.
Department 2, II Year; 1 hour per week; first term.
This title is not an entirely suitable one for this course of lectures because it is generally applied to a study of the philosophy of extremely accurate measurements. The Mining Engineer has to continually make satisfactory use of measurements with a wide range of inaccuracy. This course of lectures deals with the philosophy underlying the causes of these errors and the practical application of such approximations. The opportunity is taken in these lectures to deal with the subject of illustrating measurements by graphs.

66. *Introductory Research:*—H. E. T. Haultain and F. C. Dyer.
Department 2, III Year; 3 hours per week; second term.
This is a laboratory course including some lectures and is a preparation for the thesis of the fourth year.

67. *Thesis.*

Department 2, IV Year; 7 hours per week; first term; 10 hours per week, second term, in continuous periods.

Thesis in this department consists mainly in reports on original work done in the laboratories. In the III year the subject "Introductory Research" paves the way for the thesis. During the month of October the student decides on the subject of his thesis in consultation with his professors. After this is decided the student uses his own initiative in the development of his work.

The thesis is divided into three parts. The first part, which is handed in during the first week in November, contains the title, a statement of what the title is meant to convey and an outline of the work that is proposed to be done. The second part is handed in during the first week of January and contains a report of progress to date and enables the professor in charge to keep in closer touch with the work. The third and final part is handed in a week before the examinations and is a report of progress to date with final conclusions. The three parts combined constitute the thesis.

68. *Vacation Letters.*

Department 2, III Year and IV Year.

These are a series of letters written during the summer vacation, dealing with various aspects of a mining engineer's work. They are intended to direct and help the student's powers of observation, analysis and criticism as well as being exercises in the art of lucid technical expression. See page 31 for instructions.

69. *Vacation Work.*

Department 2, II Year.

See page 31 for detailed instructions.

ASTRONOMY AND GEODESY

71. *Astronomy, Elementary:*—C. A. Chant.

Department 1, II Year; 1 hour per week, both terms.

A course in descriptive Astronomy, explaining the ordinary astronomical terms, and describing the various celestial bodies and their motions. In the evenings opportunity will be given for identifying the stars and for observing with telescopes.

Text book:—Manual of Astronomy—C. A. Young.

72. *Astronomy and Geodesy:*—L. B. Stewart.

Department 1, III Year; 2 hours per week; both terms.

The course of lectures deals with the determination of time, latitude, longitude and azimuth, by methods adapted to the use of the surveyor's transit and the sextant. It is designed to fulfil the requirements of the final examinations for Ontario and Dominion Land Surveyors.

In Geodesy an account is given of the principles and methods of a secondary triangulation survey, also of the principles involved in the North-West system of survey.

Text books:—Practical Astronomy as applied to Geodesy and Navigation—Doolittle, Notes on Practical Astronomy and Geodesy, Nautical Almanac, 1927.

73. *Field Work:*—L. B. Stewart, S. R. Crerar.

Department 1, III Year; about 2 hours per week, first term.

The practical work in this subject comprises observations in the field with the transit and sextant for the determination of time, latitude and azimuth by the methods described in the lectures.

74. *Astronomy (Advanced):*—L. B. Stewart.

Department 1a, IV Year; 2 hours per week; both terms.

The lecture course in this subject comprises the theory and adjustment of the instruments used in connection with a geodetic survey; the methods of taking and reducing observations for time, longitude, latitude, and azimuth, with the precision required on such a survey; and other matters relating to these subjects.

75. *Geodesy and Metrology:*—L. B. Stewart.

Department 1a, IV Year; 2 hours per week; both terms.

The lecture course includes a description of the methods of measuring base lines and the angles of a triangulation; the geometry of the spheroid with applications to geodetic problems; the computation of geodetic positions; the solution of large triangles on the earth's surface, and the adjustment of a triangulation; trigonometric and precise spirit levelling; the determination of the figure of the earth by arc measurements, and by the pendulum; the theory of map projections, etc.

76. *Astronomy, Geodesy and Metrology:*—L. B. Stewart.

Department 1a, IV Year; about 23 hours per week; both terms.

The practical work in the above subjects includes the observation of meridian transits for time and longitude determinations, and of prime vertical transits for latitude, with the astronomical transit instrument; the observation of meridian zenith distances of stars, and of azimuths at elongation for latitude, with the alt-azimuth; theodolite observations for azimuth; observations for latitude with the zenith telescope; the investigation of the constants of the instruments used, and the reduction of all observations; the measurement of a base line with the steel tape and with invar

wires, and the determination of the constants of the tape; the measurement of the angles of a triangulation and the adjustment of the angles of network of triangles, etc. A portion of this work will be taken at the Summer Survey Camp. (See page 33.)

BIOLOGY

80. *Elementary Biology;*—G. H. Duff.
Department 6, I Year; 6 hours per week, first term.
An elementary laboratory course on the nature and identification of plant and animal tissues and products, with microscope practice.

81. *Elementary Biology:*—J. W. MacArthur.
Department 1_b, IV Year.
A special Course of Laboratory work and demonstrations in General Biology, five hours per week, first term.

82. *Hygiene and Bacteriology:*—D. T. Fraser and R. R. McClenahan.
Department 1_b, IV Year.
(1) This is a course of twenty-five lectures, dealing with the principles of Hygiene and Sanitary Science and including a discussion of the facts in Bacteriology which are necessary for a proper understanding of Hygiene and Sanitary Science. The particular phases of the subject which are of importance from the standpoint of Sanitary Engineering are dealt with.
(2) This is a laboratory course of six hours per week, second term, dealing especially with the Bacteriology of water, milk and sewage.

CHEMISTRY

85. *Elementary Chemistry:*—E. G. R. Ardagh.
Departments 1, 2, 3, 6, 7, 8, I Year; 2 hours per week, first term; 1 hour per week, second term.
A lecture course in elementary chemistry dealing with the non-metals, with experimental illustrations.

86. *Inorganic Chemistry:*—L. J. Rogers.
Department 6, I Year; 12 hours per week, second term.
A laboratory course of quantitative experiments illustrating the use of the sensitive balance, and confirming the fundamental laws of chemistry; qualitative inorganic analysis; quantitative analysis of pure salts.
Text books:—Analytical Chemistry, Vol. II—Treadwell-Hall; Qualitative Chemical Analysis—A. A. Noyes.

87A. *Inorganic Chemistry A:*—E. G. R. Ardagh.
Departments 1, 2, 3, 6, 7 and 8, II Year; 1 hour per week, first term.
A continuation of Course 85 dealing especially with the metals.

87B. *Inorganic Chemistry B:*—E. G. R. Ardagh.
Departments 2, 6 and 8, II Year; 1 hour per week, second term.
A lecture course on theoretical chemistry with special reference to the metals; a continuation of Course 85.
Text book:— Smith's College Chemistry—Kendall.

88. *Analytical Chemistry:*—L. J. Rogers.
Departments 2, 6 and 8, III Year; 1 hour per week, both terms.
A lecture course on the principles of chemical analysis; select gravimetric and volumetric methods; technical analysis.

89. *Analytical Chemistry;*—E. A. Smith.
Departments 1, 2 and 3, II Year; 6 hours per week, second term; Dept. 7, II Year; 6 hours per week, first term.
Laboratory course in qualitative and quantitative analysis.

90. *Analytical Chemistry:*—J. W. Bain.
Department 2, II Year; 3 hours per week, both terms.
A laboratory course in the gravimetric determination of metals and acids, with elementary volumetric analysis.

91. *Analytical Chemistry:*—L. J. Rogers.
Department 8, II Year; about 14 hours per week, first term; about 13 hours per week, second term.
A laboratory course comprising gravimetric and volumetric methods, acidimetry and alkalimetry.
Text books:—Analytical Chemistry, Vol. II—Treadwell-Hall; Qualitative Chemical Analysis—A. A. Noyes.

92. *Analytical Chemistry:*—L. J. Rogers.
Department 6, II Year; 180 hours.
A laboratory course in quantitative chemical analysis; inorganic preparations.
Text book:—Analytical Chemistry, Vol. II—Treadwell-Hall.

93. *Engineering Chemistry:*—J. W. Bain.
Departments 1, 3, 6 and 7, II Year; 1 hour per week, first term.
A lecture course consisting of a study of the industrial production and application of heat, and of the chemistry of fuel and the products of combustion.

94. *Industrial Chemistry:*—J. W. Bain.
Department 6, II Year; 1 hour per week, both terms.
A lecture course on the manufacture of salts, acids, alkalies and inorganic chemicals.

95. *Organic Chemistry:*—M. C. Boswell.
Departments 1, 2, 3 and 7, II Year; 1 hour per week, second term.
A lecture course in elementary organic chemistry.

96. *Organic Chemistry:*—M. C. Boswell.
Department 6, II Year; 2 hours per week, both terms.
A lecture course dealing with the aliphatic compounds.

97. *Organic Chemistry:*—M. C. Boswell.
Department 6, II Year; 60 hours, second term.
A laboratory course in organic preparations.

98. *Physical Chemistry:*—F. B. Kenrick.
Departments 6, II Year and Department 8 (a), III Year; 2 hours per week, both terms.
A course of lectures on the elements of chemical mechanics, and the theory of solutions.

99. *Analytical Chemistry:*—L. J. Rogers.
Department 2, III Year; 9 hours per week, second term.
A laboratory course on the technical analysis of ores and furnace products.

100. *Industrial Chemistry:*—E. G. R. Ardagh.
Department 6, III Year; about 7 hours per week, first term, 13 hours per week, second term.
A laboratory course in industrial chemistry.

101. *Analytical Chemistry and Phase Rule:*—L. J. Rogers, J. T. Burt-Gerrans.
Department 8, III Year; about 6 hours per week, second term.
A laboratory course in analysis and phase rule.

102. *Engineering Chemistry:*—J. W. Bain, E. G. R. Ardagh.
Departments 1, 2, 3, 6, 7, 8 and 8 (a), III Year; 1 hour per week, both terms.
A lecture course on the application of chemistry to engineering problems; air, water, sewage, the materials of construction, explosives, etc.

103. *Industrial Chemistry:*—E. G. R. Ardagh.
Department 6, III Year; 1 hour per week, both terms.
A lecture course on petroleum and its products, coal tar and its products; fats, oils, soap, sugar, starch, gums, rubber; fermentation industries, etc.

104. *Chemical Plant:*—J. W. Bain.
Department 6, III Year; 1 hour per week, both terms.
A lecture course on the machinery and plant used in chemical manufacturing.

105. *Organic Chemistry:*—M. C. Boswell.
Department 6, III Year; 2 hours per week, both terms.
A lecture course on the aromatic series.

106. *Organic Chemistry:*—M. C. Boswell.
Department 6, III Year; 85 hours.
A laboratory course in organic preparations in the aromatic series.

107. *Electrochemistry:*—W. L. Miller.
Departments 6, 7 and 8, III Year; Department 2, IV Year; 2 hours per week, first term.
A lecture course on elementary electrochemistry, illustrated by experiments.

108. *Electrochemistry:*—W. L. Miller and J. T. Burt-Gerrans.
Departments 6, 7 and 8, III Year; 3 hours per week, first term.
Department 2, IV Year.
A laboratory course in quantitative measurements to accompany Course 107.

109. *Inorganic Chemistry:*—J. W. Bain.
Department 6, IV Year; 2 hours per week, both terms.
A lecture course on chemical theory.

110. *Organic Chemistry:*—M. C. Boswell.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on advanced organic chemistry.

111. *Organic Chemistry:*—M. C. Boswell.
Department 6, IV Year.
A laboratory course in advanced organic chemistry; about seventeen hours first term.

112. *Industrial Chemistry:*—J. W. Bain.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on selected subjects in chemical technology.

113. *Industrial Chemistry:*—J. W. Bain, E. G. R. Ardagh, M. C. Boswell.
Department 6, IV Year.
A laboratory course in industrial problems.

114. *Electrochemistry:*—J. T. Burt-Gerrans.
Department 6, 7 and 8, IV Year; 2 hours per week, both terms.
An advanced lecture course on the theory of solutions and electrolysis, and the application to the practice of electro-deposition and electrolytic refining of metals. The course also includes lectures on the electric furnace with special consideration of efficiency.
Reference books:—Electrometallurgy—Borchers; Electrochemistry—Le Blanc; Electrochemistry—Luepke; Principles of Applied Electrochemistry—Allmand and Ellingham; The Electric Furnace—Stanfield; The Electric Furnace—Pring.

115. *Electrochemistry:*—W. L. Miller and J. T. Burt-Gerrans.
Departments 6, 7 and 8, IV Year.
A laboratory course accompanying Course 114.

116. *Sanitary and Forensic Chemistry:*—J. W. Bain.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on the composition and examination of air, water and food; poisons and their detection, with accompanying laboratory course.

116. (*a*) *Silicate Chemistry:*—J. B. Ferguson.

Department 8 (a), IV Year; 2 hours per week, second term. The application of phase rule to the chemistry of refractory materials.

117. *Sanitary Chemistry:*—E. G. R. Ardagh.

Department 1_b, IV Year; 1 hour lecture and 6 hours laboratory, first term; four hours laboratory, second term.

A lecture and laboratory course on water supply, sewage disposal, ventilation, etc.

ECONOMICS AND BUSINESS ADMINISTRATION

121. *Business:*—W. S. Ferguson.

Departments 1, 2, 3, 6, 7, 8, I Year; 1 hour per week, second term.

A lecture course on the principles underlying accounting and general business methods of a simple nature in order to enable the student to understand simple financial reports.

122. *Technical English:*—S. G. Bennett.

(*a*) All Departments, I Year; 1 hour per week, both terms.

A lecture course on the expression of ideas and the compilation and writing of different types of engineering reports; technical exposition; the derivation and use of technical terms; the necessity of accurate expression in professional writing; terminology; the use of graphic methods for presenting facts; abbreviations; numbers; symbols.

(*b*) Department 4, II Year; 1 hour per week, both terms.

This course of lectures includes a discourse on the literature which refers either directly or indirectly to architecture and the arts. Books are reviewed and discussed in round-table talks and essays prepared for practice in expression. The preparation of specifications and contracts for the execution of construction is continued from the course in the first year, specializing in architectural types.

123. *Economics and Finance:*—C. R. Fay.

All Departments, II Year; 1 hour per week, both terms.

An introduction to the study of Economics. The course will deal in an elementary fashion with the following:

(1) Scope and Method of Economics.
(2) Theory of Value and Distribution.
(3) Structure of Industry and Social Conditions.
(4) Money, Banking and Public Finance.

Text Book:—Economics for the General Reader—Clay.

124. *Commercial Law:*—A. R. Clute.

All departments, III Year; 1 hour per week, both terms. General Principles of the Law of Contracts, Principal and Agent, Partnership and Limited Companies (with special reference to the Companies Acts). General view of the following:—Negotiable Instruments, Sale of Goods, Bills of Sale and Chattel Mortgages, Suretyship and Guarantee.

Text-Book:—Stephens' Elements of Mercantile Law (6th Edition.)

125. *Engineering Economics:*—C. R. Young.

Departments 1, 2, 3, 7, 8, IV Year; 1 hour per week, second term.

A series of lectures on the principles by which the economic practicability of a project is judged and the comparison of competing proposals is made. Consideration is given to first cost and annual cost, methods of estimating, fixed charges and operating expenses, valuation and appraisals. Special attention is given to depreciation and the methods of providing for it, as well as to its relation to amortization. Typical numerical problems are discussed and solved.

Text Books:—Engineering Economies—Fish; Financial Engineering —Goldman.

126. *Engineering Law:*—R. E. Laidlaw.

Department 1, IV Year; 1 hour per week, first term.

A course of lectures, co-ordinating Engineering practice and Law as contained in various legislation such as: The Railway Act, Municipal Act, Public Health Act, Arbitration Act, Workmen's Compensation Act, Patents, Copyrights, etc.

127. *Contracts and Specifications:*—C. R. Young.

Departments 1, 4, 8, and 8 (a) IV Year; 1 hour per week, second term.

This course of lectures deals with the fundamental principles of contract and specification writing. The critical examination of typical specifications and agreements by the class, forms an essential feature of the instruction.

Text Books:—Engineering Contracts and Specifications—Johnson; Elements of Specification Writing—Kirby.

128. *Management:*—C. R. Young.

Department 1, IV Year; 1 hour per week, first term.

A series of lectures dealing with the fundamental principles upon which management is based. The possibilities of effective management are indicated and its basis is shown to exist in suitable organization, adequate equipment and smooth administration. Consideration is given to such matters as selection of personnel, essentials of effective organization for enterprises of widely different character and the art of directing a force so as to attain a desired end in an expeditious and effective manner.

Text Books:—Construction Cost Keeping and Management—Gillette and Dana; Principles of Industrial Organization—Kimball; Administration of Industrial Enterprises—Jones.

129. *Plant Management:*—G. A. Guess.
Department 8 and 8 (a), IV Year; 1 hour per week, second term.
A course of twelve lectures dealing with some phases of labour, plant organization, smelter contracts and markets.

130. *Industrial Management:*—E. A. Allcut.
Departments 3 (c), 6 and 7, IV Year; 1 lecture per week, both terms.
This course includes a study of industrial organization, location, arrangement, construction and equipment of industrial plants for efficiency and economy, process routing, scheduling work, reports, methods of superintending, employment, systems of compensating labour and systems of distributing indirect expenses.

131. *Railway Economics:*—W. M. Treadgold.
Department 1, (e), IV Year; 2 hours per week, both terms.
The object of this course is to make the student acquainted with the general principle of railroad engineering and the following branches of the subject will be discussed—economic theory of location, train resistance, effect of grade, distance and curvature, rise and fall, maintenance of way, yards and terminals, tunnels and street railway practice.

132. *Municipal Administration:*—P. Gillespie, A. T. Laing.
Department 1 (b), IV Year; 1 hour per week, both terms.
A course of lectures dealing with civics, local improvement laws and assessments, building codes, fire control, transportation, public utilities, etc.

133. *Public Speaking:*—W. H. Greaves.
Department 1, III Year; 1 hour per week, first term.
A course on the principles of public speaking and the means of expression accompanied by practical application and training in actual speaking.

ELECTRICITY

135. *Electricity:*—H. W. Price.
Departments 1, 2, 3, 6, 7 and 8, I Year; 2 hours per week, both terms.
A course of lectures on basic principles relating to electric circuits, magnetic circuits, instruments and apparatus in general, distribution of electrical energy, etc., illustrated largely from commercial apparatus. The point of view of this work is quantitative rather than descriptive, for it is believed that men who can solve engineering problems are most likely to grasp underlying principles.

136. *Electricity:*—W. S. Guest.

Departments 3, 6, 7 and 8, II Year; 2 hours per week, both terms.

Deals with the theory of electrical measurements, and detailed study of various methods applicable under different conditions in engineering practice to the measurement of resistance, current, potential difference, power and energy; calibration of commercial measuring instruments. The effect of choice of conditions of measurement on the accuracy of the result is considered.

137. *Electrical Laboratory:*—W. S. Guest.

Departments 3, 6, 7 and 8, II Year; 3 hours per week, both terms.

This laboratory course is closely associated with the lecture course 136 on electricity for the second year. The more important and useful methods of testing generators and circuits for electromotive force, resistance, current, grounds, etc., are practiced, often under conditions such as occur in practice. The work also includes methods of calibration of measuring instruments for voltage, current, power and energy, and certain studies of properties of incandescent lamps.

138. *Magnetism and Electricity:*—A. R. Zimmer.

Department 3, III Year; 1 hour per week, both terms.

Department 7, III Year; 2 hours per week, first term; 1 hour per week, second term.

A course of lectures on theory of magnetism and magnetic circuits, theory of direct-current generators, motors, etc.

139. *Alternating Current:*—A. R. Zimmer.

Department 3, III Year; 1 hour per week, both terms.

Department 7, III Year; 1 hour per week, first term; 2 hours per week, second term.

A first course of lectures on alternating current, covering principles of measurement and leading to the analytical and graphical treatment of the simpler problems relative to alternating-current circuits and machinery.

140. *Electrical Laboratory:*—A. R. Zimmer.

Department 3, III Year; 3 hours per week, both terms; Department 7, III Year; 6 hours per week, both terms.

This laboratory course is intended to afford the student an opportunity to become familiar with principles involved in continuous-current shunt, series and compound-wound generators and motors, and, to some extent, alternating-current circuits and machinery. Other sections of the work deal with the magnetic properties of iron and steel, and study of iron losses in transformers and generators.

The course is arranged to stand in close relation to the lecture courses in the subjects of magnetism and electricity and alternating current (138, 139) for III Year, and to certain design work (141).

141. *Electrical Design:*—H. W. Price.
Department 7, III Year; 1 hour per week, both terms.
A course of lectures dealing with design of electrical apparatus and machinery, accompanied by designs to be worked out in the design room.

142. *Electrical Design:*—H. W. Price.
Department 7, III Year; 3 hours per week, both terms.
A design room is set apart for working out designs of electrical apparatus such as transformers, generators, motors, auxiliary apparatus, etc.
Special forms and notes are employed, arranged to suit the various studies. Certain models are provided to assist where necessary.

143. *Electricity:*—H. W. Price.
Departments 1, 2 and 8, III Year; 1 hour per week, both terms.
A continuation of Course 135, First Year, adapted to the requirements of non-electrical students. It deals with problems on direct-current circuits and apparatus; magnetic circuits; power measurements; alternating current principles and machinery; transmission; power-plants, etc.

144. *Electrical Laboratory:*—H. W. Price, A. R. Zimmer.
(*a*) Department 1.
III Year; 3 hours per week, first term.
IV Year; Options d and e, 3 hours per week, second term.
(*b*) Department 2.
IV Year; 3 hours per week, first term.
(*c*) Department 3.
IV Year; 3 hours per week, second term.
(*d*) Department 6.
III Year; 3 hours per week, second term.
(*e*) Department 8.
III Year; 3 hours per week, both terms.
These courses are arranged to suit the requirements of the departments concerned. The experiments are planned with the idea of affording a general knowledge of circuits, power measurements, direct-current and alternating-current machinery and transmission of power.

145. *Applied Electricity:*—(*a*) Symbolic and Graphical Methods,
(*b*) Wave Form and Transmission Line—T. R. Rosebrugh.

Department 7, IV Year; 2 hours per week.
(*a*) Complex quantities and their use in a.c. problems. Loci for current and voltage vectors for given limitations on circuit constants. Short line distribution circuit loci; approximate graphical theory of synchronous motor.

(*b*) Non-sinusoidal alternating current waves, analysis of waves, forms of symmetry, three phase limitations, elimination of undesired harmonics, heating of rotary converters; power, current, and voltage readings as influenced by wave form.

Long distance transmission line; principles and calculation. Unequal lines in tandem and in parallel.

Applied Electricity, (*c*) A.C. Machinery and Measurements:—H. W. Price.

Department 7, IV Year; 2 hours per week.

Polyphase alternating-current measurements of power, reactive power, apparent power, finding the indications of meters from given wiring diagrams, constructing wiring diagrams to obtain required meter indications. Potential and current transformers. Meter indications with distorted wave forms. Power transformers. Properties of alternators; induction motors of squirrel cage and wound-rotor types; synchronous motors; regulators; current-limiting reactors; arresters; and other general apparatus.

146. *Electrical Laboratory:*—A. R. Zimmer.

Department 7, IV Year, in connection with 145; 20 hours per week.

This laboratory course involves a thorough study of principles and properties of single and polyphase circuits and apparatus. Both vector and analytical methods are applied to the solution of problems based on tests made on laboratory machines.

The work deals mainly with constant-voltage and constant-current transformers, single and polyphase alternators, synchronous motors, rotary converters, induction and single phase commutating motors, transmission line, etc. The work does not consist only of factory tests, but is designed to lead the student to apply theory to practice as illustrated in the apparatus under test, with a view to an exact understanding of methods and an appreciation of limitations under many conditions. Free use is made of the oscillograph as a necessary device for "seeing" conditions under investigation. The best commercial measuring instruments are available.

147. *Radiotelegraphy:*—T. R. Rosebrugh.

Department 7. Option *r*, IV Year, in connection with 148; 2 hours per week.

Natural oscillations of simple and simply coupled circuits. Action of C.W. on circuits of the most general character. Radiation of antennas. Theory of modulation in radiotelephony. Energy control and transformation by vacuum tubes.

148. *Radiotelegraph Laboratory;*—A. M. Patience.

Department 7. Option *r*, IV Year, in connection with 147; 9 hours per week.

The work in this laboratory covers the principles and the technique of measurements at radio frequencies. This includes measurements of wave length, resonance, coupled circuits, inductance, capacity, energy distribution, resistance, etc., at radio frequencies.

Considerable work is also done with the three electrode vacuum tube and its uses in radio and audio-frequency circuits.

ENGINEERING DRAWING AND DESCRIPTIVE GEOMETRY

160. *Descriptive Geometry:*—J. R. Cockburn.

Departments 1, 2, 3, 6, 7 and 8, I Year; 1 hour per week; both terms.

This course of lectures deals chiefly with the principles of orthographic and oblique projections and the application of such principles to the solutions of problems relating to straight lines and planes.

161. *Descriptive Geometry:*—J. R. Cockburn.

Department 4, I Year; 1 hour per week; both terms.

This course of lectures deals chiefly with the principles of orthographic and oblique projections and the application of such principles to the solution of problems relating to straight lines and planes, special reference being made to the determination of shades and shadows.

162. *Descriptive Geometry:*—J. R. Cockburn.

Departments 1, 2, 3 and 7, II Year; 1 hour per week, both terms.

This course of lectures is a continuation of the work taken in the first year with the following additions: Problems relating to curved surfaces, principles of shades, shadows and perspective.

163. *Descriptive Geometry:*—J. R. Cockburn.

Department 4, II Year; 1 hour per week, both terms.

This course of lectures is a continuation of the work taken in the First Year with the addition of problems relating to curved surfaces, shades, shadows and perspective.

164. *Descriptive Geometry:*—J. R. Cockburn.

Department 1, III Year; 1 hour per week, first term.

This course of lectures deals with spherical projections, the principles of mapmaking, and the graphical solution of spherical triangles.

166. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.

Departments 1, 2, 3, 7 and 8, I Year; 11 hours per week, first term; 18 hours per week, second term.

Copying from the flat, lettering, topography; graphical solution of problems in statics; problems in descriptive geometry, relating to both orthographic and oblique projections; the plotting of original surveys; measured drawings.

167. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Department 4, I Year.
Lettering, the graphical solution of problems in statics; problems in descriptive geometry, relating to both orthographic and oblique projections; measured drawings.

168. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Department 6, I Year; 8 hours per week, first term.
Copying from the flat, lettering, graphical solution of problems in statics, problems in descriptive geometry.

169. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Departments 1 and 2, II Year. Department 1, 4½ hours per week, first term; 13½ hours per week, second term. Department 2, 3 hours per week first term; 12 hours per week, second term.
Colouring and shading as applied to both topographical and construction drawings; problems in descriptive geometry relating to solids bounded by curved surfaces; principles of shades, shadows and perspective; solution of problems in optics and strength of materials; measured drawings; elementary design.

170. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Departments 3 and 7, II Year; Department 3, 13 hours per week, first term; 11 hours per week second term; Department 7, 12 hours per week, both terms.
Coloring and shading as applied to construction drawings; problems in descriptive geometry relating to solids bounded by curved surfaces; principles of shades, shadows and perspective; solution of problems in optics, theory of mechanism and strength of materials; measured drawings; elementary design.

171. *Engineering Drawing:*—J. R. Cockburn.
Department 4, II Year.
Principles of shades, shadows and perspective; problems in descriptive geometry relating to solids bound by curved surfaces; solution of problems in strength of materials.

172. *Engineering Drawing:*—J. R. Cockburn, W. J. T. Wright.
Department 6, II Years; 7 hours per week, first term; 3 hours per week, second term.
Department 8, II Year; 3 hours per week, first term; 6 hours per week, second term.
(Same as Department 3 with the exception that Dept. 6 has no descriptive geometry.)

173. *Engineering Drawing:*—W. B. Dunbar.
Department 1, III Year; 15 hours per week first term; 12 hours per week, second term.
Principles of mapmaking, spherical projection; problems in theory of construction; original design of various structures.

174. *Engineering Drawing:*—W. B. Dunbar.
Department 2, III Year; 9 hours per week, first term.
Problems in theory of construction; original design.

177. *Engineering Drawing:*—W. B. Dunbar.
Departments 3, 6 and 8 (a), III Year; Department 3, 9 hours per week, first term; Department 6, 6 hours per week, first term; Department 8 (a), 6 hours per week, both terms.
Problems in design dealing with the theory of structures.

178. *Structural Design Drawing:*—W. J. Smither.
Department 1 (c), IV Year; 22 hours per week, both terms.
Problems in structural design.

179. *Structural Design Drawing:*—W. J. Smither.
Department 1*b*, IV Year; 5 hours per week, second term.
Department 1*d*, IV Year; 4 hours per week, first term; 8 hours per week, second term.
Department 1*e*, IV Year; 6 hours per week, both terms.
Problems in structural design.

180. *Structural Design Drawing:*—W. J. Smither.
Department 3, IV Year; 3 hours per week, both terms.
Problems in mill building design.

181. *Structural Design Drawing:*—W. J. Smither.
Department 3, IV Year, Option (b); 3 hours per week, both terms.
Problems in reinforced concrete design.

182. *Engineering Drawing:*—W. B. Dunbar.
Department 8, III Year; 3 hours per week, first term.
Plotting metallurgical flow sheets.

183. *Structural Design Drawing:*—J. Roy Cockburn.
Department 8 (a), IV Year; 6 hours per week, both terms.
Original design of ceramic plants, driers, kilns, etc.

ENGINEERING PHYSICS

185. (*a*) *Illuminating Engineering:*—G. R. Anderson.
Departments 3 and 7, I Year.
A course on the production and distribution of artificial light. Photometry and illumination calculations. Principles of interior lighting.
Lectures and laboratory work, both terms.

185. (*b*) *Geometrical Optics:*—G. R. Anderson.
Departments 1 and 6, I Year.
Nature of light, reflection, refraction, and dispersion. Theory of optical instruments. Polarization of light and its applications.
Lectures and laboratory work, both terms.

186. *Hydrostatics:*—G. R. Anderson.

Departments 1, 3, 6, 7, II Year.

Laws of fluid pressure and application to machines. Density of solids, and fluids. Theory of flotation.

Lectures and laboratory work, second term.

187. *Heat:*—G. R. Anderson.

Departments 1, II Year.

Generation and propagation of heat. General and industrial thermometry, calorimetry and pyrometry. Linear and cubical expansion, gas laws. Specific heat of solids, liquids and gases, latent heat of fusion and vaporization. Mechanical equivalent of heat. Carnot cycle.

Lecture and laboratory work. Fall term.

188. *Photography:*—G. R. Anderson.

Department 1, II Year.

The camera and its adjustments, lenses, shutters, screens. Plates for various purposes, films, prevention of halation. Lighting, exposure, development. Paper of various kinds, printing, enlargement and reduction, blue printing and allied processes. Record photography, photogrammetry and photo-surveying. Photography in colour.

Lectures Fall term, and laboratory work both terms.

189. *Illumination:*—G. R. Anderson.

Department 4, II Year.

A special course on interior illumination, and the design of lighting installations for private and public buildings.

190. *Acoustics:*—G. R. Anderson.

Department 4, III Year.

Elementary acoustics, including production of sound by vibrating bodies. Special attention to the acoustics of buildings including the properties and uses of deadening material and calculations of reverberation.

191. (*a*) *Acoustics:*—G. R. Anderson.

Department 7, IV Year.

Wave motion, Fourier's theorem, laws of vibrating systems, musical scales. Reflection and refraction of sound waves.

Combined lecture and laboratory course, first term only.

191. (*b*) *Photographic Surveying:*—G. R. Anderson.

Department 1a, IV Year; 1 hour lecture and 2 hours laboratory, first term.

This course presupposes a general knowledge of photographic processes as given in the second year. Treatment of a photograph as a perspective drawing from which plan and elevation to scale may be obtained under certain conditions. The intersection method of photographic surveying, its advantages and limitations. The stereoscopic method with its advantages and disadvantages. Method of plotting. Accuracy of results.

192. *Illumination Design:*—G. R. Anderson.
Department 7, IV Year.
The design, installation and maintenance of artificial lighting for commercial and industrial operations. Street lighting. Economics of illumination.

GEOLOGY

193. *Field Work:*—E. S. Moore.
Department 2, III Year; one week preceding the opening of the first term.

194. *Pleistocene Geology and Physiography:*—A. MacLean.
Departments 2 and 8 (a), IV Year; 1 hour per week, both terms.
Pleistocene Geology.—Lectures on the formation and distribution of the drift deposits of North America, with brief references to other regions. Glacial, Interglacial, and Postglacial beds are described, changes of climate are discussed with their probable causes, and the economic features of the clays, sands, and gravels are pointed out.
Physiography.—A course of lectures on the surface forms of the earth, with the geological factors which have produced them. The broad features of the earth, its plains, tablelands, hills, valleys, mountains, oceans, rivers, and lakes are discussed in a general way; methods of topographical surveying and mapping are referred to, and the chief physiographic areas of Canada are described.

195. *Elementary Geology:*—W. A. Parks.
Departments 1, 2, II Year; 2 hours per week, second term.
This course deals chiefly with historical geology with special reference to Canadian formations.
Works of Reference:—Introduction to Geology—Scott; Elementary Geology—Coleman and Parks.

196. *Geology and Ore Deposits:*—A. MacLean.
Department 8, II Year; 2 hours per week, both terms.
Lectures and laboratory work on historical, structural, and economic geology, designed to familiarize the student with the more important principles, facts, and terms of general geology.
Works of Reference:—As in Course 195.

197. *Engineering Geology:*—A. MacLean.
Department 1 and 8 (a), III Year; 1 hour per week, both terms.
This course deals with the application to engineering of dynamic, structural, and economic geology.
Works of Reference:—Engineering Geology—Ries and Watson.

198. *Dynamic and Structural Geology:*—A. MacLean.
Department 2, III Year; 1 hour per week, first term.
Lectures on geological forces and their effects. Particular attention is given to those aspects of the subject which apply in mining.

199. *Precambrian Geology:*—E. S. Moore.
Department 2, IV Year; 2 hours per week, first term.
Lectures on the Precambrian formations of Canada—their rocks, distribution, relationships, and economic features. Briefer accounts are given of similar formations in the United States and elsewhere.
Works of Reference:—Reports of the Geological Survey of Canada and of the Ontario Department of Mines; Reports of the United States Geological Survey.

200. *Mining Geology:*—E. S. Moore.
Department 2, IV Year; 2 hours per week, second term.
A course of lectures on geological problems associated with mining, typical mining regions in Canada, the United States, and elsewhere being discussed from the geological side.
Works of Reference:—Mineral Industry; Ore Deposits of United States and Canada—Kemp; and the works mentioned under Course 199.

201. *Geological Excursions:*—The Staff in Geology.
Departments 2 and 8 (a), IV Year.
During October and November weekly trips will be made to points of interest near Toronto.

202. *Economic Geology:*—E. S. Moore.
Department 2, III Year.
(*a*) *Ore Deposits:* 1 hour per week, both terms.
Discussion of the origin and classification of ore deposits, the mode of occurrence of the chief ores, and statistics of production. Special attention is given to the metals mined in Canada.
(*b*) *Economic Geology of the Non-metals:* 2 hours per week, second term.
Lectures on the origin and mode of occurrence of the valuable non-metallic substances—coal, oil, building stone, gypsum, cement materials, etc.
Works of Reference:—Economic Geology—Ries; General Economic Geology—Emmons; Ore Magmas—Spurr; Coal—Moore; Practical Oil Geology—Hager.

203. *Economic Geology:*—E. S. Moore.

Department 2, III Year; 2 hours per week, second term.

Laboratory work on ores, manner of occurrence, vein structure, etc., also the examination and construction of geological maps and sections of typical mining regions.

204. *Special Geology:*—A. MacLean.

Department 1 (e), IV Year; 1 hour lecture and 1½ hour laboratory work per week, second term.

A lecture and laboratory course on superficial geology, physiographic control, water geology, etc.

Works of Reference:—Political and Commercial Geology—J. E. Spurr.

HYDRAULICS

205. *Hydraulics:*—R. W. Angus.

Departments 1, 2, 3, 6, 7, III Year; 2 hours per week, both terms.

This is a course of lectures in hydraulics devoted to the development and discussion of formulae relating to the flow of water in pipes, the measurement of discharge by various methods, such as orifices and weirs, the conditions of flow obtaining in open channels, artificial and natural, and in pipes flowing partially full, together with other kindred subjects.

The object of this course is to provide the student with a good working knowledge of the fundamental principle of hydraulics, such as is useful in practical work, and is necessary to the intelligent investigation of more advanced problems, such as the design of water supply, sewerage and irrigation system, and water power plants.

206. *Hydraulic Laboratory:*—R. W. Angus, R. Taylor.

Departments 1, 3, III Year; one 3 hour period per week, second term.

Departments 6, 7, III Year; 4 periods of 3 hours each.

The work in this course is intended to illustrate the lecture course given in hydraulics and to give the student some working acquaintance with the formulae met with in practice. Experiments are made to determine the coefficients for orifices of the various types used in practice and for a weir. The results of these experiments are used in measuring the discharge in subsequent experiments on meters and for the determination of hydraulic resistances in various cases of flow in pipes. The complete course illustrates very fully the application of the course of lectures to actual cases.

207. *Hydraulics:*—R. W. Angus.

Departments 1 (d), 3 (a), 3 (b), 7, IV Year; 1 lecture per week, both terms.

A course of lectures dealing with the various problems of unsteady flow such as occurs in power lines, penstocks, etc. Much of the work is done by the process of arithmetic integration, and the lecture work is supplemented by problems solved by the students in the work rooms, the time for which is included in course 209. Surges, water hammer, stream flow data, etc., are discussed.

The problems of collection of water for power purposes, use of the mass curve, rainfall and evaporation, turbine governing, etc., are also treated.

208. *Hydraulics:*—R. W. Angus.

Departments 1 (d), 3 (a), 3 (b), 7, IV Year; 2 lectures per week, both terms.

The most important question considered and to which most of the lectures are devoted is the theory of turbines and centrifugal pumps, the effect of the design on the speed, discharge and efficiency being fully taken up. The course includes the selection of turbines and pumps for given service intakes, draft tubes and all matters connected with hydraulic power plants.

Text Book:—Water Power Engineering—Mead.

209. *Hydraulics:*—R. W. Angus, R. Taylor.

Departments 1 (d), 3, 7, IV Year; about 10 hours per week in 3 hour periods, both terms; Department 3, Option (c), first term only.

A laboratory course devoted to experimental work on turbines of various types and centrifugal and turbine pumps and other similar devices. This experimental work is arranged to illustrate the lectures on turbine and pump design. The experiments are made on two large turbine pumps used in the laboratory supply, as well as on apparatus specially designed for instruction. Various methods of measuring water-power and the efficiency of machines are also given. A list of the equipment now available, and which is used in this course, is given at the end of the Calendar.

210. *Hydraulic Laboratory;*—R. W. Angus, R. Taylor.

Departments 2, III Year; 8, IV Year; 3 hours per week, second term.

A laboratory course of experiments on orifices, weirs and meters. See No. 206.

211. *Hydraulics:*—R. Taylor.

Department 1_b, 1_e, IV Year; one hour lecture per week, first term.

A laboratory course of 3 hours per week, first term, on measurement of water, flow in open channels and on pumps.

212. *Hydraulics:*—R. Taylor.
Department 3, IV Year, Option (c); one hour lecture per week, both terms.
A lecture course on pumps and other hydraulic machinery.

HEAT ENGINES

216. *Steam Engines:*—E. A. Allcut.
Departments 3 and 7, II Year; 1 lecture per week, both terms.
Departments 2 and 8, II Year; 1 lecture per week, first term.
This course of lectures includes a discussion of the history and development of the steam engine and the functioning of its various component parts. Special attention is given to the theory and design of valves and valve operating mechanisms.

217. *Thermodynamics:*—E. A. Allcut.
Departments 3, 6 and 7, III Year; 2 lectures per week, both terms.
In this lecture course the laws of heat are used to develop the characteristic equation for a perfect gas and the use of thermal lines on the pressure-volume diagram. The properties of Carnot's cycle are then considered, followed by application of these principles to the hot-air engine, internal combustion engine and air compressor. A consideration of the properties of vapours and their application to the steam engine cycle concludes the course.

218. *Heat Engines:*—E. A. Allcut.
Department 3, III Year; 2 lectures per week, both terms.
Departments 7 and 8, III Year; 1 lecture per week, both terms.
The course in Heat Engines is intended to supplement the general lecture course in Thermodynamics by showing the practical applications of the laws discussed therein. A general consideration of the laws of combustion and heat transmission is followed by their application to boiler practice. Details of steam, gas and oil engines are described and the lectures are arranged as far as possible to supplement the information obtained in the laboratory course 219.

219. *Thermodynamics and Mechanical Laboratory:*—R. W. Angus, E. A. Allcut, J. E. B. Shortt.
Department 3, III Year; one 3 hour period per week, both terms.
Department 7, III Year; 3 hours per week, first term; 1 hour per week, second term. Time to be in three-hour periods.
This laboratory course is designed to assist in a clearer understanding of thermodynamics, machine design and mechanics of machinery. The work in thermodynamics consists in the setting of slide valves, indicating engines measuring the brake horse-power, simple engine and boiler tests and the testing of gas and gasoline engines

under various conditions. The mechanical laboratory work deals with the efficiency of belts as well as of several machines of simple construction. An examination of lubricating oils is also made by means of well-known methods. Experiments are also made on the balancing of reciprocating and rotating masses.

220. *Thermodynamics:*—E. A. Allcut.

Departments 3 (a) and (c) and 7 Thermodynamics Option, IV Year; 2 lectures per week, both terms.

This is a continuation of course 217, the general thermodynamic theory being studied from the conception of the thermodynamic surface. The theory of the flow of gases and vapours through orifices, nozzles and pipes is then discussed and its application to the various forms of turbines is outlined. Following this, the principles of refrigeration, binary fluid engines and internal combustion are dealt with.

221. *Heat Engines:*—E. A. Allcut.

Departments 3 (a) and (c) and 7 Thermodynamics Option, IV Year; 1 lecture per week, both terms.

This course is a continuation of the lectures on heat engines given in the Third Year, with special application to the steam power plant. The causes of the various losses occurring in steam engines and the considerations that influence them are studied in detail. Special attention is given to condensing plants, consumption records and other factors upon which the efficiency of a power plant depends.

222. *Thermodynamics;*—R. W. Angus, E. A. Allcut, J. E. B. Shortt.

Departments 3 (a) and (c) and 7 Thermodynamics Option, IV Year; about 9 hours per week, in 3 hour periods.

The work in this year is a continuation and extension of the work covered in the third year laboratory course. Careful tests are made of engines of various types, such as simple, tandem and cross-compound steam engines; steam turbine; refrigerating machine; injectors and steam pumps, etc.; and an application is made of Hirn's analysis and the entropy diagram to the results obtained. A complete set of experiments is made on each machine and the result plotted so as to show clearly to the student the effect of various alterations in the adjustment of the engine on the resulting efficiency.

Several modern gas and gasoline engines give ample opportunity for the study of this type of engine, and facilities are provided for sampling the gas supply and exhaust.

Two experimental stacks and three boilers enable results to be obtained on boiler efficiency and chimney draft.

223. *Thermodynamics:*—E. A. Allcut.
Departments 1 and 8 (a), III Year; 1 lecture per week, both terms.
Departments 2 and 8, IV Year; 1 lecture per week, both terms.
The general principles of thermodynamics, the properties of a perfect gas and their application to the Carnot cycle are first studied. This is followed by a consideration of the air compressor cycle, some details of air compressor operation and the theory of the flow of air through pipes and orifices. The properties of vapours and the principles of steam engine operation are also discussed.

224. *Thermodynamic Laboratory:*—J. E. B. Shortt.
Departments 1, 6 and 8 (a), III Year; seven three hour periods, second term; Departments 2 and 8, IV Year; 3 hours per week, first term.
A course of experiments with steam and gas engines, compressed air, etc.

225. *Motive Power:*—R. W. Angus.
Department 1 (e), IV Year; one hour per week, both terms.
A course of lectures covering boiler capacity, locomotive horse-power, tractive effort, etc., necessary to carry specified trains over different conditions of roadbed.

226. *Heating and Ventilation:*—E. A. Allcutt.
Department 3, IV Year; Option (*c*); one hour per week, first term.
This course is designed to give a working acquaintance with the essential engineering principles underlying the practice of heating and ventilation work.

227. *Refrigeration:*—E. A. Allcut.
Department 3, IV Year; Option (*c*); one hour per week, second term.
A course covering the principles underlying mechanical refrigeration, physical properties of different refrigerants, and a study of the various standard types of refrigerating machines and systems.

228. *Thermodynamics Laboratory:*—J. E. B. Shortt.
Department 3, IV Year, Option (*c*); three hours per week, both terms.
A laboratory course on heating, ventilation, refrigeration, etc.

MACHINERY

230. *Theory of Mechanism:*—J. H. Parkin.
Departments 3 and 7, II Year; lectures 2 hours per week; problems 1½ hours per week, both terms.
This course of lectures treats of the elementary construction of machines and of the motions of the various parts. Methods of determining linear and angular velocities, methods for the solution of elementary problems involving forces and methods for the determination of the mechanical efficiency of machines

are discussed. Velocity diagrams, crank effort and torque diagrams are plotted. Cams, toothed gearing and various types and applications of trains of gearing are considered.

Applications of the methods described are made to various machines including engines, machine tools, link motions, etc., and the lecture work is followed up by the solution of numerous examples in the drafting room.

Text Book:—Theory of Machines—Angus.

231. *Mechanics of Machinery:*—J. H. Parkin.

Departments 3 and 7, III Year; 1 hour per work, both terms.

This course is devoted to a consideration of the speed regulation and balancing of machines, and comprises lectures on the theory of various forms of governors, kinetic energy of machines and determination of speed fluctuations, the proper weight of fly-wheel, acceleration and inertia effects, and balancing.

The methods of analysis employed are those developed in course 230.

Text Book:—Theory of Machines—Angus.

232. *Elementary Machine Design:*—J. H. Parkin.

Departments 3, 6 and 7, II Year; 1 hour per week, both terms.

This is a preparatory course intended to familiarize the student with the different shop methods and processes, casting, forging, machining, etc., used in the production of machine parts, to enable him to make proper provision in the design of such parts to facilitate their production.

In addition, the various standards, machine and pipe threads, tapers, pipe fittings, etc., are described and mechanical drafting room practice explained.

Tolerances, limits, fits and gauges are discussed.

The design of simple machine fastenings and parts is taken up and examples worked out in the drafting room.

233. *Machine Design:*—J. H. Parkin and W. G. McIntosh.

Departments 3 and 7, III Year; 2 lectures per week, both terms.

The design work averages 7 hours per week for Department 3, and 4 hours per week for Department 7, the periods to be of not less than 2 hours' duration.

The lectures in this course deal with the design of various machine elements, including shafting, bearings (journal, thrust, ball and roller), belts,. pulleys, fly-wheels, clutches, springs, machine frames, etc.

The problems worked out in the drafting room are planned to include the design of all of the above and with a view to developing the student's judgment and sense of proportion in design.

234. *Machine Design:*—J. H. Parkin and W. G. McIntosh.
Department 6, IV Year; Department 8 and 8 (a), III Year; Department 2, II Year; 1 lecture per week, both terms.
The design work occupies 3 hours per week for the second term only.
The lectures in this course deal with the design of various machine elements, particularly those likely to be met with in Chemical and Metallurgical plants, and in mining work.
The problems worked out in the drafting room are designed to give the student training in the general lay-out of shafting and plant machinery, as well as in the design of simple parts for chemical and metallurgical apparatus, and mine machinery.

235. *Advanced Machine Design:*—J. H. Parkin and W. G. McIntosh.
Department 3, IV Year; 2 lectures per week in the first term, 1 lecture per week in the second term.
The design work averages 6½ hours per week for Option (*a*), 6 hours per week for Option (*b*) and 7 hours per week for Option (*c*), the periods to be of not less than 2 hours' duration.
The work of this course is devoted to the design of complete machines with the object of giving the student practice not only in the design of various details, but also in working in the various elements into a machine of smooth and harmonious design. The machines chosen as examples for design involve as many new machine elements as possible in order to broaden the training of the student.

MATHEMATICS

236. *Calculus:*—M. A. Mackenzie and S. Beatty.
All Departments, I Year; 2 hours per week, each term.
Treatment of limits with special reference to those pertaining to exponentials and logarithms. Derivation of the fundamental formulae of the differential and integral calculus, with early application to simple problems concerning graphs, areas, volumes, lengths, etc.

237. *Calculus:*—M. A. Mackenzie and S. Beatty.
Departments 1, 3, 6 and 7, II Year; 1 hour per week, both terms.
Continuation of course 236. The elementary theory reviewed and extended. Special attention to applications with problems in Engineering mostly in view.

238. *Analytical Geometry:*—A. T. DeLury.
All Departments, I Year; 1 hour per week, first term, 2 hours per week, second term.
The course in Elementary Analytical Geometry covers the more familiar propositions in connection with the straight line, circle, parabola, ellipse and hyperbola. The subject is treated so as to illustrate the general methods of analytical geometry.

239. *Trigonometry, Spherical:*—L. B. Stewart.
Department 1, II Year; 1 hour per week, first term.
A course of lectures includes the derivation of formulæ and their application to the solution of triangles and to practical problems.
Text Book:—Spherical Trigonometry—Todhunter and Leatham.

240. *Least Squares, Method of:*—L. B. Stewart.
Department 1, III Year; 1 hour per week, second term.
The course of lectures includes: The general principles of probability, the law of error, direct measurements of equal and different weights; mean square and probable errors; indirect measurements; conditioned observations; applications to empirical constants and formulæ, etc.
Text book:—Least Squares—Merriman.

METALLURGY

241. *Elementary Metallurgy:*—G. A. Guess.
Departments 1, 2, 3, 6 and 8, II Year; 1 hour per week, second term.
A course of about 12 lectures on furnace metallurgy and present practice, with special reference to iron and steel.

242. *Fuels and Combustion:*—G. A. Guess.
Department 8, II Year; 1 hour per week, both terms.
A lecture course dealing with fuels, their use, preparation, calorific value and combustion.

243. *Metallurgy:*—G. A. Guess.
Departments 2, 6, III Year; 1 hour per week, both terms.
Fuels, temperature of combustion, specific heat, conductivity and problems thereon; chimneys, furnaces, refractories, outline of furnace metallurgy and hydro-metallurgy.

244. *Physical Metallurgy:*—O. W. Ellis.
Departments 2, 3, 6 and 7, III Year; 2 hours per week, second term.
The physical properties and structure of iron and steel and the more common alloys.

245. *Metallurgy:*—G. A. Guess, J. E. Toomer.
Department 8, III Year; 2 hours per week, first term; 1 hour per week, second term.
A lecture course on General Metallurgy accompanied by 3 hours laboratory per week, first term, and 6 continuous hours per week second term.

246. *Physical Metallurgy:*—J. A. Newcombe.
Department 8, III Year; 1 hour per week, both terms.
Changes of phase and of state, pyrometry, preparation of alloys, miscibility of metals, binary, ternary and complex alloys, the use of the microscope, with 3 hours laboratory per week, first term.

247. *Metallurgy:*—G. A. Guess, J. E. Toomer.
Departments 2 and 6 (k), IV Year; 1 hour lecture per week, both terms; 6 continuous hours laboratory per week, second term.
General metallurgy and metallurgical problems.

248. *Metallurgy Problems:*—G. A. Guess, J. E. Toomer.
Department 8, IV Year; 2 hours lecture and 4 hours laboratory, both terms.
Metallurgical book-keeping, balance sheets, thermal balance sheets, methods and processes.

249. *Metallurgy:*—G. A. Guess.
Department 8, IV Year; 1 hour per week, both terms.
Critical reading and discussion of papers and articles, describing metallurgical processes or dealing with plant arrangement and construction. Metallurgical flow sheets of typical plants.

250. *Physical Metallurgy:*—J. A. Newcombe.
Departments 6 (k) and 8, IV Year; 1 hour lecture and 3 hours laboratory per week, both terms.

251. *Metallography:*—J. A. Newcombe.
Department 2, IV Year.
A laboratory course of 3 hours per week, second term.

252. *Physical Metallurgy:*—J. A. Newcombe.
Department 1 (c), (d) and (e), IV Year; 1 hour per week, both terms.
The physical properties of metals and alloys used in Civil Engineering practice—specifications.

253. *Heat Treatment of Iron and Steel:*—J. A. Newcombe.
Department 3, IV Year; 1 lecture per week, both terms.
Heat treatment of iron and steel, case carburizing, case hardening and malleableizing.

CERAMICS

254. (*a*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 4 hours per week, first term; 2 hours per week, second term.
Lectures covering origin, properties and classification of clays and other ceramic materials from a mnaufacturing standpoint; methods of manufacture, including preparing, shaping and burning clay ware.

254. (*b*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 2 hours per week, second term.
Lectures on the composition of clear and coloured glazes

254. (*c*) *Ceramics:*—J. E. Toomer.
Department 8 (a), III Year; 1 hour per week, second term.
Lectures and problems on calculations necessary for the compounding of ceramic bodies and glazes.

254. (*d*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 6 hours per week, both terms.
Work on the identification and testing of clays.

254. (*e*) *Ceramics:*—J. E. Toomer.
Department 8 (a), III Year; 6 hours per week, both terms.
Laboratory practice in the analysis of ceramic materials.

254. (*f*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 2 hours per week, first term.
Lectures on composition and properties of refractory material; composition of bodies made with ceramic material, with special reference to white-ware and porcelain.

254. (*g*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 2 hours per week, second term.
Lectures on the manufacture and composition of glass; manufacture and composition of iron enamels.

254. (*h*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 1 hour per week, first term.
Lectures on specifications, testing and methods of testing ceramic materials.

254. (*i*) *Ceramic Laboratory:*—R. J. Montgomery.
Department 8 (a), IV Year; 9 hours per week, both terms.
Advanced work on compounding and testing ceramic bodies and glazes.

MINERALOGY

255. *Elementary Mineralogy:*—J. E. Thomson.
Department 2, I Year; Department 8 (a) III Year; 2 hours per week, first term.

After introducing the student to the chief chemical, physical, and crystallographic characteristics of minerals, the course becomes descriptive and deals with about one hundred of the minerals most important from the industrial or scientific point of view.

Text Book:—Study of Minerals and Rocks—Rogers.

256. *Mineralogy:*—J. E. Thomson.
Departments 6 and 8, I Year; 2 hours per week, first term; 1 hour per week, second term.
Introduction to determination of minerals by inspection and physical tests.
Text Book:—Mineral Tables—Eakle.

257. *Primary Mineralogy:*—A. L. Parsons.
Department 1, II Year; 2 hours per week, first term.
A very brief introduction to the study of minerals and rocks.
Text books:—Study of Minerals and Rocks—Rogers; Hand-Book of Rocks—Kemp.

258. *Mineralogy:*—J. E. Thomson.
Department 2, I Year; 1 hour per week, first term; 3 hours per week, second term.
Department 8 (a), III Year; 1 hour per week, first term.
Determination of minerals by inspection and by means of physical tests; introduction to blow-pipe practice.
Text books:—Mineral Tables—Eakle; Determinative Mineralogy—Lewis.

259. *Mineralogy:*—A. L. Parsons, J. E. Thomson.
Department 1, II Year; 1 hour per week, first term; 2 hours per week, second term.
Determination of minerals by inspection and by means of physical tests; study of common rock types and their identification.
Text books:—Mineral Tables—Eakle; Handbook of Rocks—Kemp.

260. *Elementary Petrography:*—T. L. Walker.
Department 2, II Year, and Department 8 (a), III Year; 1 hour per week, both terms.
A course of lectures and laboratory work introducing the student to the macroscopic study of rocks.
Text-books:—Handbook of Rocks—Kemp.

261. *Mineralogy:*—J. E. Thomson.
Department 2, II Year; 2 hours per week, both terms.
Determination of minerals by means of the blow-pipe and physical properties.
Text books:—Mineral Tables—Eakle; Determinative Mineralogy—Lewis.

262. *General Petrography:*—A. L. Parsons.
Department 2, III Year, and Department 8 (a), IV Year; 1 hour per week, both terms.
Study of the chief rock-forming minerals and of some phases of petrography not covered in the course of the previous year.
Text Books:—Minerals in Rock-Sections—Luquer; Petrology for Students—Harker.

263. *Petrography:*—T. L. Walker.
Department 2, III Year, and Department 8 (a), IV Year; 2 hours per week, both terms.
Study of the chief rock-forming minerals, of rocks in thin sections and in hand specimens.
Text books:—Petrology for Students—Harker; Minerals in Rock Sections—Luquer.

MODERN LANGUAGES

266. *French:*—J. H. Cameron, Miss J. C. Laing, L. A. Bibet.

Required in Department 4, I and II Years; 2 hours per week, both terms; III Year, 1 hour per week, both terms.

(*a*) Practice in translation of selected texts bearing on some phase of architectural study.

(*b*) A course in Conversation to encourage the student to acquire a speaking knowledge of the language.

267. *German:*—B. Fairley, T. J. Hedman, G. E. Holt.

Department 6, all years; I Year, 2 hours per week, both terms; II, III, IV Years, 1 hour per week, both terms.

An elementary course intended to train the student in the translation of scientific journals and treatises.

268. *Spanish:*—M. A. Buchanan.

Departments 6*k*, IV Year; 8, II Year; 1 hour per week, both terms.

An introduction to Spanish grammar, pronunciation and practice in reading Engineering Spanish.

PHYSICAL TRAINING

269. *Physical Training:*—G. D. Porter, D. M. Barton.

Required in all departments, I and II Years, and optional in the III and IV. Years.

By order of the Board of Governors each male student proceeding to a degree must take Physical Training in the first and second years of his attendance. In each session in which Physical Training is compulsory he must first undergo a medical examination by the Director of the University Health Service, and must then register for Physical Training at the office of the Athletic Association in Hart House. Students of all years who wish to take part in any form of athletics or physical exercise, must first undergo a medical examination by the Director. Those classified as A1 may elect to take any form of competitive athletics during the season in which that form of sport is in progress.

Military training in the C.O.T.C. constitutes an option in Physical Training (see page 126).

SURVEYING

270. *Surveying:*—S. R. Crerar.

Departments 1, 2, 3, 7 and 8, I Year; 1 hour per week, both terms.

The lecture course includes the general principles; surveying with the chain, the compass and chain and the transit and chain, and level, the applications of trigonometry to inaccessible heights and distances; mensuration of surfaces, co-ordinate surveying, division of land, etc.

Text books:—Plane Surveying—Tracy; Theory and Practice of Surveying—Johnson and Smith; Elementary Surveying—Breed and Hosmer.

271. *Field Work:*—S. R. Crerar, J. W. Melson.

Departments 1, 2, 3, 7 and 8, I Year; 6 hours per week, first term.

This course comprises testing chains; practice in chaining; a complete survey of a piece of land with the chain and transit; keeping of field notes; the use of the transit and compass in surveying closed figures and traverse lines and in ranging straight lines; plotting by latitudes and departures, and otherwise computing areas. Instrumental work with level, including roadway improvement.

272. *Surveying:*—W. M. Treadgold, E. W. Banting.

Departments 1 and 2, II Year; 1 hour per week, both terms.

This course of lectures takes up in detail, simple, reverse and compound curves as applied to railroad surveying. It also includes stadia, plane table and photographic surveying as applied to topographic work, and the main features of mine and hydrographic surveying.

Text books:—Henck, Searles, Allen (Field books for Engineers) Theory and Practice of Surveying—Johnson and Smith; Surveying—Breed and Hosmer.

273. *Field Work:*—W. M. Treadgold, E. W. Banting.

Department 1, II Year; 9 hours per week, first term.

Department 2, II Year; 6 hours per week, first term.

This course of instruction embraces all adjustments of the transit and level, minor problems in triangulation and traversing—levelling and plane table practice.

274. *Surveying and Levelling:*—W. M. Treadgold.

Department 1, III Year; 1 hour per week, both terms.

This course of lectures takes up the work of the railroad engineer on construction, including profiles, cross sectioning, computation of volume of earthwork, overhaul, transition curves, laying out turnouts, frogs and switches, etc.

Also a discussion of trigonometric and barometric levelling.

Text books:—Field Engineering—Searles; Railroad Curves and Earthworks—Allen.

275. *Survey Camp:*—W. M. Treadgold, S. R. Crerar, E. W. Banting, J. W. Melson.

Departments 1 and 2, III Year; Department 1a, IV Year.

This course includes:

(*a*) Secondary Triangulation and Base Line Measurements.

(*b*) Stadia, Plane Table and Boundary Traverses.

(*c*) Highway and Railway Location.
(*d*) Cross Sectioning and Computation of Earthwork.
(*e*) Stream Gauging and Discharge Measurements.
(*f*) Hydrographic Surveying.
(*g*) Photographic and Micrometer work.
(*h*) Stadia and Plane Table Topography.
(*i*) Mine Surveying.
(*j*) Observations for Time, Azimuth and Latitude.
(*k*) Geological Survey.

This work is taken at Gull Lake Camp. See page 33.

276. *Railroad Location and Design:*—W. M. Treadgold.

Department 1 (e), IV Year; 1 hour lecture per week, both terms; about 8 hours per week, both terms, in the drafting room.

This work will consist of an original survey for a railroad some one or two miles in length, the work to be carried out according to the most modern methods of location. Upon the completion of the field work, the complete survey will be plotted and a line adjusted to it. This will be staked out, profiles taken and the computation made of the earthwork and the preparation of overhaul diagram compiled for determination of haul and borrow. In the second term the design of track work, yards and practical problems will be taken up and special problems assigned.

ADDITIONAL FOURTH YEAR COURSES

280. *Sanitary Engineering:*—Peter Gillespie.

Department 1_b, IV Year; 1 hour lecture per week, both terms; 3 hours laboratory, first term; and 6 hours, second term.

Consideration is given to the problems of water supply, sewerage and sewage disposal as viewed by the engineer. Some practice in the design of works from assumed data is afforded. Excursions to places of interest are arranged from time to time.

Reference Books:—Public Water Supplies—Turneaure and Russell; American Sewerage Practice—Metcalf and Eddy, 3 vols.

281. *Highway Engineering:*—A. T. Laing.

Department 1_b, IV Year; 1 hour lecture and 3 hours laboratory per week, both terms.

This course of instruction deals with the design, construction and maintenance of public highways and street pavements, also with the properties of the materials employed. Accompanying the course of lectures is a laboratory course dealing with the various bituminous and non-bituminous materials of construction. Excursions to places of interest are arranged for during the fall term.

282. *Municipal Seminar:*—P. Gillespie, A. T. Laing.
Department 1_b, IV Year; 3 hours per week, both terms.
This time is devoted to reading, essay writing and discussion of problems relating to highways, transportation, town planning, sanitation and kindred subjects.

283. *Zymology:*—H. B. Speakman.
A study of the phenomena of fermentation and their industrial applications.

THESIS

285. *Thesis.*
Required in all Departments, IV Year, with the exception of Department 4, Architectural Design Option.
"Each student must prepare a thesis on a subject and in a form approved by the head of the department in which the student is registered."

OUTLINE OF VACATION WORK

286. *Construction Notes.*
II Year. Departments 1, 2, 3, 4, 6, 7.

The construction notes required consist of neat and complete dimensioned sketches in pencil of any structures, machines or plants which may be of interest. Any object chosen should be represented and dimensioned in such a manner that it could be completely constructed from the notes as the only available information. (See page 31.)

From students in Department 2, who have been actually engaged during the summer with Government or other approved geological survey parties, geological field notes will be accepted in lieu of construction notes.

287. *Vacation Work:*—C. H. C. Wright, H. H. Madill, E. R. Arthur.
Department 4, III Year.
Each student is required to submit a set of rendered measured drawings of existing buildings or portions of buildings, the building first to be approved by the head of the Department, who will also decide the number and size of the drawings to be made. The record of measurements must be preserved in a notebook which will be submitted with the final drawings.

288. *Vacation Work:*—C. H. C. Wright, C. W. Jefferys.
Department 4, IV Year.
Each student is required to submit a set of at least six outdoor sketches in water colour, pen and ink, or pencil. The minimum size for each sheet will be $9'' \times 12''$. Of these sketches at least two will be in water colour and three will be of an architectural character.

SCHOOL OF ENGINEERING RESEARCH

A School of Engineering Research, within the Faculty of Applied Science and Engineering, was established in the Spring of 1917 at the suggestion of the late Dean Ellis.

The School is under the direct supervision of a Committee of Management composed of fifteen Members of the Faculty Council. To this Committee is entrusted the selection of researches to be undertaken under the auspices of the School, and the disposition of funds conducting them.

The School was organized chiefly for the training of graduates in methods of research, and for the carrying out of investigations. These latter may be problems relating to specific industries or raw materials and having a specific end in view, or general problems having to do with fundamental principles.

A number of research assistants are appointed annually in the various departments of the Faculty to carry on the work of research under direction of members of the staff. The facilities of the School are also open to graduates who desire to penetrate more deeply into particular phases of experimental work, or to undertake investigations either suggested by members of the staff or arising from their own work since graduation.

Address communications to the Secretary—Professor Maitland C. Boswell, Ph.D.

ADVANCED COURSE IN HYDRO-ELECTRIC POWER

In view of the importance of Hydro-Electric power in Canada, further facilities are offered to those graduates who wish to supplement the present extensive undergraduate courses bearing upon this subject. Graduate studies may be pursued by candidates for the Degree of Master of Applied Science as soon as desired after graduation.

To those returning after satisfactory experience in some approved phase of Hydro-Electric work, somewhat more specialized courses may be given than are possible with very recent graduates. The Engineering Alumni Association of the University has expressed its willingness and desire to assist such candidates in obtaining suitable employment to fit them for these courses of study, but such courses are available only to those with the proper undergraduate preparation.

Graduates who may wish to avail themselves of the arrangements proposed are advised to communicate with the Dean.

It should be noted that candidates for post-graduate degrees register with the Secretary of the School of Graduate Studies. For further particulars see Calendar of the School of Graduate Studies and page 110 of this Calendar.

MASTER OF APPLIED SCIENCE DEGREE
MASTER OF ARCHITECTURE DEGREE

1A. A candidate for the degree of M.A.Sc. shall hold the degree of B.A.Sc. of this University or a degree from some other University recognized as equivalent by the Council of the School of Graduate Studies.

1B. A candidate for the degree of Master of Architecture should hold the degree of Bachelor of Architecture or the degree of Bachelor of Applied Science in Architecture of this University or a degree from some other University recognized as equivalent by the Council of the School of Graduate Studies.

2. He shall register with the Secretary of the School of Graduate Studies at the beginning of the academic year.

3. Not later than November 1 of his academic year, he shall submit to the Secretary for acceptance by the School of Graduate Studies the title of his proposed thesis as approved by the department concerned.

4. Not later than April 30th of his academic year, he shall present evidence to the Council of the School of Graduate Studies that he has spent not less than one academic year of the department concerned as a student enrolled in one of the following departments on a course of study approved by the department:—Civil Engineering, Mining Engineering, Mechanical Engineering, Architecture, Chemical Engineering, Electrical Engineering, Metallurgical Engineering.

5. Not later than April 30th of his academic year, evidence that the candidate has satisfactorily met all the requirements of the department with regard to thesis and to such examinations as the department shall require, shall be forwarded to the Council of the School of Graduate of Studies through the sub-committee administering the regulations governing the degrees of M.A.Sc. and M.Arch.

PROFESSIONAL DEGREES

The attention of graduates is directed to the following regulations respecting professional degrees.

The following degrees have been established: Civil Engineer (C.E.), Mining Engineer (M.E.), Mechanical Engineer (M.E.), Electrical Engineer (E.E.), Chemical Engineer (Chem.E.), Metallurgical Engineer (Met.E.), subject to the following regulations:

1. A candidate for one of the said degrees shall hold the diploma of the School of Practical Science or of the Faculty of Applied Science and Engineering or the degree of Bachelor of Applied Science.

2. He shall have spent at least three years after receiving the diploma or the degree in the actual practice of the branch of engineering wherein he is a candidate for a degree.

3. Intervals of non-employment or of employment in other branches of engineering shall not be included in the above three years. It shall not be necessary that the several periods requisite to make up the said three years be consecutive.

4. Satisfactory evidence shall be submitted to the University examiners as to the nature and length of the candidate's professional experience for the purpose of clauses 2 and 3.

The Examiners may satisfy themselves by oral or written examinations in regard to the candidate's experience and competence.

5. The candidate shall prepare an original thesis on some engineering subject in the branch in which he wishes a degree, the said thesis to be accompanied by all necessary descriptions, details, drawings, bills of quantities, specifications and estimates.

The candidates may be required at the option of the Examiners to undergo an examination in the subject of this thesis.

6. Notice in writing shall be sent to the Secretary not later than the first day of November, informing him of the degree to which the candidate wishes to proceed and of the title of his proposed thesis for the approval of the Examiners.

7. The evidence under clause 4, and the thesis, with accompanying papers, described in clause 5, shall be sent to the Secretary not later than the first day of April.

8. The candidate shall be required to present himself for examination in the month of April at such time as may be arranged by the Examiners.

9. The fee for any one of the said degrees shall be twenty dollars, and shall be paid to the Bursar not later than the first day of April.

10. The thesis, drawings, and other papers submitted under clause 7 shall become the property of the University.

11. Nothing in this statute shall prevent any candidate from receiving more than one of the said degrees, provided he has the necessary qualifications for each degree. An interval of three years must elapse between the granting of any two degrees under this statute.

12. All communications must be addressed to the Secretary of the School of Graduate Studies.

CERTIFICATE FOR HIGH SCHOOL ASSISTANT

The Calendar of the Ontario College of Education provides for the admission of the holder of a degree in Science to the Course for a High School Assistant's certificate. The regulation requires that the applicant shall submit with his application:

"His certificate of graduation as Bachelor or Master of Arts, Bachelor or Master of Science, Bachelor of Commerce, Bachelor of Agriculture, or Bachelor of Applied Science, from a British University, after the regular university course approved by the Minister of Education as to entrance requirements and as to content of the undergraduate courses. Each applicant must have Upper School or Honour Matriculation standing in English and History and Mathematics or the equivalent of such standing."

SPECIALISTS' CERTIFICATES FOR HIGH SCHOOL TEACHERS

By an arrangement between the University and the Department of Education of the Province of Ontario, provision is made for graduates in Applied Science to obtain High School Specialists' Certificates under conditions which can be ascertained by reference to the Special Announcement of the University in connection therewith.

LABORATORY EQUIPMENT

THERMODYNAMIC AND MECHANICAL LABORATORY

The University in 1919 completed the erection of a large, well-equipped building for the accommodation of the steam, gas, mechanical and hydraulic laboratories. A more complete description of the laboratories has been published elsewhere, so that the present description is only intended to give the main features.

The part of the building set apart for thermodynamics and other mechanical work is the ground floor of a room 60 ft. x 155 ft. This room is lighted entirely from the roof in a very perfect way. A part of the space 40 ft. wide running the entire length of 155 feet is served by a 3 ton travelling crane and contains the following equipment:

50 h.p. Brown engine with separate jackets on both heads and barrel of cylinder.

Two-stage Rand air compressor having compound steam cylinders, each fitted with Meyer cut-off gear. The low pressure air cylinder has Corliss inlet gear.

30 h.p. high-speed Leonard tandem compound engine with shaft governor.

15 h.p. high-speed McEwan engine.

40 h.p. Uniflow engine.

25 h.p. General Electric steam turbine.

Two 15 h.p. Leonard engines with different types of valves, which are used for valve setting.

There are also two surface condensers with air pumps so arranged that any engine in the laboratory may be made to exhaust into the atmosphere through an open heater or into one of the condensers, the change from one arrangement to the other being accomplished in a few minutes without the aid of valves.

The laboratory further contains:

A 3 ton York refrigerating machine with tanks.

An Amsler transmission dynamometer.

Apparatus for testing injectors and steam pumps.

Hot blast heating equipment.

Numerous other pieces of apparatus and instruments.

The work on internal combustion engines and producers is performed on the following:

Experimental gas producer.

14 h.p. National gas engine arranged for various compressions and points of ignition.

10 h.p. Fielding and Platt engine for city gas or coal oil, having various adjustments

25 h.p. Allen semi-Diesel engine.

25 h.p. tractor gasoline engine.

Six cylinder Buick automobile engine.

200 h.p. Sprague electric dynamometer.

Various accessories to above machines.

Steam for the laboratory is supplied by two 50 h.p. and one 100 h.p. Babcock and Wilcox boilers, the latter having an internal superheater. These boilers are located in a separate boiler room. They are used for experimental work only and are fitted up for testing. The gases pass up through two independent chimneys, and these have been arranged so that the draft and other conditions in the chimney at any point of its height may be examined.

In smaller work-rooms off the main laboratory are placed belt and oil testing machines, apparatus for testing the efficiency of gears and machines, and for experiments in the balancing of machinery.

HYDRAULIC LABORATORY

The hydraulic laboratory occupies two floors each 40 feet x 112 feet, which are well lighted by large windows on the side and end.

The water for the experimental work is pumped through the various pieces of apparatus from a well by means of two turbine pumping units, both of which are driven by a Belliss and Morcom compound engine of 125 h.p. running at a speed of 525 revs. per minute. Both engine and pumps have been installed with a view to using them in experimental work as well as for supply of water for other apparatus used in the laboratory.

The pumping units are capable of delivering one cubic foot of water per second against heads of 250 feet and 300 feet respectively. These units are designed and connected up so that they may be run in series giving the above discharge at 550 feet head, or they may be run in parallel giving double the discharge at a lower head. Each pumping unit consists of two two-stage pumps mounted on a common base and driven by a single pulley, and the construction and piping are such that each two-stage pump may be driven separately or that all may be driven at once, discharging separately one cubic foot per second at about 125 feet head through each of four independent pipes, or else the pumps may be run in series or in parallel. The scheme is thus well adapted to laboratory work, and under the heads used on reaction turbines about six cubic feet per second may be obtained.

In addition to this there is an electrically driven pump capable of delivering six cubic feet per second at a head of sixty-five feet and which is most helpful in turbine testing. Attention is called to the special turbine testing flume described below.

The laboratory further contains a large vertical steel tank 5½ feet diameter by 34 feet with arrangements for the attachment of nozzles

and other mouthpieces, etc. Connections are also arranged for reaction turbines, the tank acting as a reservoir.

The discharge from the turbines or nozzles is measured in a weir tank nearly 6 feet wide and 21 feet long, containing a contracted weir 4½ feet wide. This weir may be calibrated by two weighing tanks, each having a capacity of about 240 cubic feet.

There are three reaction turbines and two impulse wheels all ready for experiment, the power being measured by brakes and the water by weir or orifices. Amongst the reaction turbines may be mentioned the one designed and built by Escher Wyss & Co., specially for the laboratory.

A new and specially designed turbine testing flume has recently been added to the laboratory, the machinery for which has been largely furnished through the kindness of the Dominion Engineering Works, Montreal, and Wm. Cramp and Sons, Philadelphia. This flume is supplied with water by a Moody spiral pump of twelve cubic feet per second capacity and at present there are two turbines, one of the propeller type, and also two special draft tubes and more will be added. This provides an excellent opportunity for experiment and research.

Smaller orifice and weir tanks, each about 3 x 3 x 12 feet with necessary measuring tanks, are arranged for instruction in coeficients of various kinds and practice with weirs and orifices.

A Venturi meter and other meters, also an hydraulic ram and similar devices are available for testing, and good facilities have been arranged for investigating friction and other properties of pipes and fire hose.

For special investigations on turbine and centrifugal pumps, other pumps in addition to those already described have been arranged.

The basement of the laboratory contains an open trough 5 feet wide, about 110 feet long, with a large weir at one end. It is intended to use this trough for experiments on the flow in open channels, for measurements of large discharges by means of the weir, and for experiments with current meters and Pitot tubes.

Numerous pieces of smaller apparatus, together with all instruments required, have also been provided, and the laboratory equipment is believed to be very complete.

AERODYNAMIC LABORATORY

The Aerodynamic Laboratory is located in a separate special building. The Laboratory is fully equipped with an improved 4-ft. Royal Aircraft Establishment type wind channel, aerodynamic balance, micromanometers and other necessary instruments.

Air speeds of 80 feet per second can be secured in a stream of great steadiness and uniformity and higher speeds with some sacrifice in steadiness.

The work done in the Laboratory includes the investigation of problems in aerodynamics, tests of air craft components, and complete machines, rating of meters, ventilators, radiators, etc., and the study of the effect of wind pressure on structures, chimneys, etc.

ENGINEERING PHYSICS LABORATORIES

Illuminating Engineering

The laboratories are equipped with ordinary and precision photometer benches with integrating mirrors and rotators, photometric spheres from 15 inches to 6 feet, portable illuminometers, spectro-phometer, etc. A room is also provided containing outlets for various types of industrial, commercial and house lighting units, for measurement of illumination values. For work in optics there is provided optical benches for the testing of lenses and instruction in the theory of instruments together with a general equipment of telescopes, field glasses, microscopes, sextants, etc.

Heat and Hydrostatic Laboratory

This laboratory is equipped with a full supply of apparatus required for the practical work in these subjects.

Acoustical Laboratory

The equipment here consists of forks, pipes, sonometers, etc., to illustrate the general work in this subject together with special equipment for work in architectural acoustics as taught to architects.

Donations

Through the generous donations of the manurfactures of lighting equipment and accessories, a Lighting Demonstration Room to illustrate the latest practice in industrial, commercial and house lighting has been established as a permanent exhibit. The following companies have co-operated and their contributions are gratefully acknowledged:

All-American Radio Corp.
Benjamin Electric Co.
Bryant Electric Co.
Canadian General Electric Co.
Canadian Westinghouse Co.
Consolidated Glass Co.
Cutler-Hammer Co.
Cutter Co. per D. M. Fraser Ltd.
Curtis Lighting Inc.
Frank Adam Electric Co. per Taylor Mfg. Co.
Gleason-Fiebout Glass Co.
Hart Mfg. Co. per Bongard Ltd., Ivanhoe Division.
Jewell Instrument Co. per D. M. Fraser Ltd.
Miller Co.
Pittsburg Reflector Co. per Wilson Illuminating Co.
Tallman Brass Co.
Walcott Mfg. Co. per Bongard Ltd.
Wheeler Co. per C.G.E.

PHOTOGRAPHIC AND PROJECTION LABORATORIES

The Photographic Laboratory contains a supply of small cameras for the use of students, enlarging cameras, printers, blue printing machine and the necessary dark rooms.

This Department also carries on a photographic and projection service for all Faculties and Departments of the University. The equipment for this work consists of cameras for making photographs up to full plate size, enlargers, photo-micrographic apparatus, motion picture cameras for both gross and micro work, with the necessary developing and printing machines, a rotary blue print machine, a photostat, etc.

For projection service there is a motion picture projector and a number of projection lanterns for service in any University Building.

ELECTRICAL LABORATORIES

The Department of Electrical Engineering is located in the Electrical Building. The accommodation includes quarters for staff, library, lecture rooms, laboratories, stores, and shop for repairs and construction.

Services.—Three-wire direct-current, 110 kw., from the University power house, automatically regulated at our end for constant voltage of desired value at our main switchboard. Three-phase, 60 cycles, 60 k.v.a., 115 volts, automatically regulated as to voltage and frequency. Three-phase, 25 cycles, 30 k.v.a., automatically regulated as to voltage and frequency. Every laboratory has all three services available at convenient places. There are three main boards, one for each floor. A system of special trunk lines between boards, and tree systems on each floor, enable easy arrangement of any desired special connections from any laboratory to any other.

Alternating current laboratory.—Area 26 x 110 ft., service sets 60 and 25 cycles, Tirrill regulators. Two 60-cycle and two 25-cycle, 15 k.v.a. motor-generator sets; converters; various motors, squirrel cage and wound rotor induction types, repulsion and other single-phase types, unity power factor motor, polyphase motor with variable speed shunt characteristics and speed range of 4 to 1; transformers, single and three-phase; constant-current transformers with load of series arc lamps; lamp racks, reactors, condensers, brakes, etc.; oscillographs; indicating, graphic, recording, and demand meters of the best makes; all arranged to facilitate a very general line of experimental work.

Direct current laboratory.—40 kw. 230 to 115 volt motor generator set with Tirrill regulator for special tests. Numerous 5 kw. to 10 kw. motor-generator sets; shunt, series, compound motors; special interpole machines; loading racks, dynamometers, rheostats, numerous meters of first quality, etc., for any sort of study.

Measurements Laboratory.—26 x 110 ft. Fitted with very flexible storage battery service which can be connected to any desired working place; d.c. three-wire service, also 60 and 25-cycle three-phase everywhere; galvanometers, resistance boxes, bridges, shunts, potentiometers, standard cells, bond testers, ductor, megger, apparatus for measuring low resistances, artificial lines for fault measurements, condensers, inductances, rails, cables, voltmeters, ammeters, wattmeters, dynamometers, etc., for general work on a great variety of measurements.

High voltage laboratory.—For various lines of study with voltages up to 200,000 volts. Flexible and safe provision for control.

Materials laboratories.—One specially fitted for general work on conducting materials, one for magnetic materials, one for dielectric materials.

Radio laboratory.—Adapted for the measurement of various quantities of interest in this work, including the strength of incoming signals. One single conductor aerial 1,000 ft. long, one multi-conductor aerial 120 ft. long.

Standardizing laboratories.—One students' calibration room for direct-current meters, another for alternating-current meters. A standards room, constant temperature, for master standards of voltage, resistance, current, power, etc.

Research laboratories.—Four rooms set apart for this work, in combination with facilities of the other laboratories.

Design laboratory—Arranged for calculation work on apparatus selected to illustrate essential principles.

CHEMICAL LABORATORIES

The Chemical laboratories are situated in the western half of the Chemistry and Mining building, on the first and second floors. The rooms are large and well lighted, and are supplied with the usual modern equipment.

The first and second year laboratory for qualitative work has accommodation for 112 students, each working space being supplied with water, gas and fume cupboard. The laboratory for quantitative analysis will accommodate 48 students, and is supplied with commodious fume cupboards and all necessary apparatus. A laboratory with working places for 36 is provided for the students engaged in the study of technical chemistry; it is equipped with appliances for the preparation and testing of chemical products. Laboratories for fourth year students with accommodation for twenty workers has been fitted up. Each of these laboratories has its own balance room adjoining furnished with instruments from the best makers and adapted to the particular objects in view.

In addition there are rooms set apart for research, for gas analysis, and a specially constructed fireproof laboratory for combustion, crucible and bomb furnaces. Each of these laboratories is supplied with apparatus of the most approved design, providing excellent facilities for the prosecution of work in analytical and technical chemistry.

A room in the basement, set apart for the purpose, has been equipped, as a laboratory for carrying on chemical operations on a small factory scale.

ELECTROCHEMICAL LABORATORIES

The Electrochemical laboratories, which are situated in the Chemistry and Mining building, are provided with special facilities for electrolytic work, including a large storage battery and electroplating dynamo with tanks as well as a good set of apparatus and electrical measuring instruments. The experimental work on electric furnaces is carried out in a large furnace room in the basement, occupied jointly by this Department and the Department of Metallurgy. The equipment for this purpose comprises a 120 KW, 110 volt generator supplying direct current through a switchboard, rheostats, circuit-breaker and instruments to a set of distributing bus-bars, and a 200 KV-a transformer stepping down from 2200 volts to 30-120 volts in 3 and 6 volt steps, which supplies alternating current at 25 cycles. There is a complete set of A.C. instruments, circuit-breakers, oil-switches, relays, automatic regulating winches, etc., and a Northrup high frequency furnace with its transformer is also installed.

ASSAYING LABORATORIES

These are situated in the west end of the basement in the Mining Building. They consist of five rooms, in addition to a library for study and an instructor's room. The East laboratory, 17 x 47 feet, and the West laboratory, 28 x 37 feet, are equipped with coal, oil, gas, and electric furnaces of various design. A Hoskin's electric resistance furnace has an automatic temperature regulator and a voltage control. Each room has a fume cupboard, and the necessary equipment for the wet work in connection with assaying. Accommodation for twenty-four students at a time is provided, by individual work desks, each supplied with a balance, weights, fluxes, tools, drawers and lockers. Common to both laboratories is the balance room which has a cement table on brick piers to support the bead balances. These are illustrative of the types met in practice. The latest model with a sensitivity of 1/500 milligram, is equipped with multiple weight attachment, and a mechanical pan extractor. Adjoining the West laboratory is a research room. A store-room adjoins the East laboratory where fluxes, clay ware and extra parts are kept. In the instructor's room are stored a large number of ores and bullion, obtained chiefly from typical mining districts and metallurgical plants, for class use. The preparation of ores is done in the Milling building, where crushers, pulverizers and sampling devices are available. A special laboratory sampler has been constructed for the purpose of giving samples for the student's assays, of indisputable similarity, thus confining variations in results to the students' work. Other apparatus includes Guess-Haultain stationary electrolytic outfits, King rotating electrolytic apparatus, microscopes, optical resistance and thermocouple pyrometers, hand and foot cupel machines, grinding plates and screens.

MINING AND ORE DRESSING LABORATORY

A detached building 72 ft. x 70 ft. contains the Mining and Ore dressing equipment. It is heated, lighted and supplied with power from the central plant. It is divided into several parts, the larger being 72 ft x 53 ft. by 22 ft. high.

In this room is a 5-stamp battery with amalgamation plates, Wilfley table, Deister Plat-o table, Deister slime table, buddle, and classifiers of sufficient size to make tests on lots of from one to ten tons.

In addition are a set of small Wilfley tables, two 3-compartment jigs, a 2 ft. x 3 ft. tube mill, a small experimental tube mill, agitators, small classifiers and other testing apparatus for experimenting on the falling rates of ore particles, slime settling, surface tension and flotation processes. These include a Case machine, a K. and K. machine, a Ruth machine, a Callow cell, etc. Water is supplied from a tank in the roof. The machinery is all motor driven.

One portion of the room is devoted to rock drills of various types and other mining apparatus.

The other part of the building, 72 ft. x 17 ft., is divided into several rooms and contains a Hadfield's Gyratory Crusher, 16 in. x 12 in. Rolls, small crushers, screening machine, and sampling apparatus. The crushers are driven by a 30 h.p. motor in another room.

The other rooms contain a Wetherill magnetic separator, screen sets, a smithing equipment, workshop and storage for small lots of ore. The larger part of the ore supply is accommodated in bins outside the building.

The plant throughout is intended mainly for teaching and experimental purposes.

There has recently been added apparatus especially designed for research work in various phases of rock crushing and grinding:—Ball Mills with plate glass ends for the study of ball paths; a small Ball and Rod Mill on ball bearings with dynamometer; a set of high grade miniature Rolls in ball bearings with integrating dynamometer.

METALLURGICAL LABORATORIES

This laboratory, in the East end of the Mining building, occupies about 3,600 sq. ft. on the basement floor and the same space immediately above on the ground floor. The basement floor is divided into one large furnace room, a small hydrometallurgical room and two store-rooms. The furnace room contains a motor driven Connersville blower, several gas fired furnaces, two small blast furnaces, and a small 6 hearth Wedge roasting furnace. The larger electric furnaces of the Department of Electrochemistry are in this room. Some are supplied with direct current, others with A.C. from a 200 K.V.A. transformer. A system of flues, with hoods

over all the furnaces, leads through a Cottrell precipitator of the Rathbun type taking current at 50,000 volts, to a stack through which gases are pulled by a fan in the attic.

The hydro-metallurgical room in addition to apparatus for leaching tests contains several natural draft furnaces, a large Hoskins resistance furnace and a 113 lb. drop hammer. There are also tanks for electrolytic refining and precipitation of metals.

The upper floor is divided into laboratories, store rooms and offices. The laboratories are: 1. Metallurgical analysis; 2. Heating treatment and pyrometry; 3. Grinding, polishing and etching; 4. Metallographic room with an adjoining dark room.

In the laboratory for metallurgical analysis the student is given some training in mill and smelter methods of analysis. It is well equipped for this work.

In the heat treatment and pyrometry laboratory are a number of tube furnaces of different sizes, a Leeds & Northrup transformation point indicator with furnace, double thermocouple and twin galvanometer, a Leeds & Northrup potentiometer pyrometer, a disappearing filament pyrometer, and many thermocouples for use with galvanometer or potentiometer. For grinding and polishing there is provided two motor driven emery wheels and a set of 3 motor driven horizontal polishing plates.

The Metallographic room is equipped with the latest type Bausch & Lomb horizontal inverted microscope type of photo micrographic apparatus, an older and horizontal photo micrographic instrument made by Pellin, Paris; two vertical photo micrographic instruments and three other metallographic microscopes.

There are also a Pellin instrument for the determination of critical points by photography according to the Saladin method and a Leeds & Northrup type "K" precision potentiometer, which is also used for the determination of critical points.

The laboratory has a Rockwell hardness testing machine, and a wire drawing bench.

The Ceramic equipment includes:

A dry pan and a vertical ,plug mill.

A small dry press.

A plunger machine with tile and hollow ware dies.

An Abbé six jar ball mill.

A recuperative down draft clay testing furnace of brick construction.

An oil fired muffle decorating kiln.

A small Seger test furnace.

A high temperature oxygen acetylene furnace.

Standard screens, volumeters, elutriation apparatus driers and such sundries as are necessary for clay testing.

MECHANICS OF MATERIALS LABORATORY

This laboratory is available for the scientific and commercial testing of materials of construction such as iron, steel, timber, concrete and masonry.

It is supplied with the following:

An Emery 50-ton hydraulic machine, built by Wm. Sellers & Co., of Philadelphia, for making tests in tension and compression.

A 200 ton, three-screw power testing machine, built by Riehlé Bros., Philadelphia. It will make tests in tension, compression, shear and cross-bending, and will take posts 10 feet long and beams of 16 feet in span.

A Riehlé 100 ton screw power universal testing machine, taking posts 12 feet long and beams of 18 ft. span.

A Riehlé 10-ton screw power universal testing machine.

A Riehlé 50-ton screw power universal testing machine.

A Riehlé standard brick rattler.

A 15-ton single lever-machine, built by J. Buckton & Co., Leeds, England.

A torsion machine, built by Tinius Olsen & Co., Philadelphia, for testing the strength and elasticity of shafting. This machine will twist shafts up to 16 feet in length and 2 inches in diameter.

A hand power torsion machine of simple mechanical construction, specially designed for the testing of short shafts of a maximum diameter of one inch.

A Riehlé transverse testing machine of 5,000 pounds capacity, adapted to specimens up to 48 inches in length.

A Riehlé compressometer, with spherical seat attachment for the adjustment of specimens having slightly non-parallel faces. This compressometer will receive specimens up to 10 inches in length.

An Olsen compression micrometer of standard type.

A 20,000 pound Olsen, hand power, wire testing machine, specially fitted for testing wooden columns with both fixed and pivoted ends.

An Olsen combined tension and cantilever type impact testing machine.

An Olsen, 20,000 pound, hand power testing machine especially adapted for testing long columns.

An Olsen, 200 pound capacity, textile testing machine.

A Riehlé abrasion cylinder, built to the standard required by the National Brickmaker's Association, adopted in 1901.

A Berry strain-gauge for spans of 3 inches and 8 inches.

A Nalder dividing engine. This may be used either for the precise division of scales or for the calibration of instruments intended for refined measurements.

A Brinell hardness testing machine.

A Shore scleroscope for testing hardness.

A large number of extensometers of the usual degree of precision. These include the Bauschinger, Martens, Unwin, Ames, Riehlé, Johnson, Henning (recording) and other types. In addition there are the usual scales, micro-

meters, telescopes and reflectors, voltmeters for the determination of metallic contact, and such other appliances as are necessary in the making of precise measurements.

The shop is equipped with a number of high-class machine tools specially fitted for reducing the specimens to the requisite shapes and dimensions with a minimum of hand labour. It is also supplied with the necessary appliances for making ordinary repairs and for making apparatus for special experiment and original investigation.

HIGHWAY LABORATORY

ROAD METALS

This laboratory is equipped for carrying out investigations in the various materials employed in highway construction and maintenance, and comprises the following:

Page impact machine for testing the toughness of road materials.

Diamond core drill for preparing specimens for the toughness test.

Deval abrasion machine for testing the resistance to wear of road materials.

Cementation testing apparatus (Page type) for determining cementing properties of road materials.

Jaw crusher (Mitchell type) for crushing rock for various tests.

Power driven agitator with sieves for the mechanical analysis of sand, gravel and crushed rock.

Dorry hardness testing machine for determining the hardness of rock used in road construction.

BITUMENS

This laboratory is designed for the investigation of the physical rather than the chemical properties of bitumens used in road construction and maintenance. The equipment consists of an extractor for separating bitumens and aggregates, an Engler viscosimeter, a penetration apparatus as well as appliances for determining melting point, volatilization, specific gravity, ductility, etc.

LABORATORY OF ONTARIO BOARD OF HEALTH

Through the courtesy of the Secretary of the Provincial Board of Health for Ontario the facilities of the excellently equipped laboratory which the Board maintains at Stanley Park have, with certain conditions, been placed at the service of the University for the investigation of problems of interest to the sanitarian and the sanitary engineer. The equipment consists of various types of sewage sedimentation tank, sewage filter, sewage measuring devices, aerators, sterilizing appliances and a complete and representative plant intended for the filtration and sterilization of water by practically all known methods.

CEMENT TESTING LABORATORY

This laboratory is fitted with all the ordinary moulds, sieves, balances burettes, steaming and drying tanks, tables, and other appliances necessary in making the usual physical tests of a Portland cement. It is also supplied with completely equipped cabinets for individual work. In addition there are the following:

A 2,000 lb. Riehlé shot machine for tension.

A 2,000 lb. Fairbanks shot machine for tension.

A 1,000 lb. Olsen automatic shot machine fitted for tests in either tension or cross breaking.

An Olsen soapstone moist closet of modern design.

METROLOGICAL LABORATORY

The department of surveying and geodesy is provided with all the ordinary field instruments, such as transits, levels, compasses, micrometers, sextants, planimeters, plane tables, tapes, chains, etc., with which is carried on the instruction in practical field operations as detailed elsewhere.

A small laboratory is also established in the basement of the observatory described below, containing the necessary instruments for the refined measurements of geodetic surveying; as, a standard yard and metre, a Rogers 10-foot comparator, an invar base measuring apparatus, a Kater's pendulum with vacuum chamber, a level trier, micrometer microscopes, etc.

The geodetic observatory in connection with this department is used for the instruction of students of the Fourth Year in taking observations for time, latitude, longitude, and azimuth by the precise methods used in connection with a geodetic survey. It contains a 10-inch theodolite and zenith telescope by Troughton & Simms; an astronomical transit instrument and an 8-inch theodolite by Cooke; two electro-chronographs; a Howard astronomical clock; a Dent sidereal clock; a Dent sidereal break-circuit chronometer; a wireless receiving instrument; arithmometers, etc.

GEOLOGICAL AND MINERALOGICAL LABORATORIES

In the Chemistry and Mining building on College Street the University possesses a modern laboratory for Geology and Mineralogy.

Courses are given in laboratory work, especially in personal examination of type sets of rocks, fossils, minerals and crystal models. These laboratory exercises serve to illustrate the introductory didactic instruction.

For the encouragement of pure crystallography the laboratories are supplied with goniometers of the various types, crystal models, appliances for the cutting of oriented crystal sections and for the physical examination of the same. Practical petrography is carried on in rooms provided with type sets of rocks, both macroscopic and microscopic. Advanced students are taught to make thin sections of rocks and fossils and to study them

microscopically. For students in Mining a laboratory course in the interpretation of geological maps and sections is provided. Typical mining regions are studied in detail and an opportunity is afforded for the examination of specimens illustrating economic geology.

The laboratory for the preparation of thin sections of rocks, minerals and fossils is provided with electric diamond saws and grinding appliances for the various types of work incidental to the preparation of thin sections and museum material.

A room is also provided for advanced work in cartography and geological surveying.

The departments possess 28 petrological microscopes and 5 of other types, so that it is now possible to provide advanced students with instruments and sets of thin sections for their own especial use. The blowpipe laboratory contains 156 lockers, especially designed for apparatus for students. Provision is made for the study of opaque minerals in reflected light.

LIBRARY

The University Library is contained in a building of its own, situated on the east side of the campus, that lies to the south of the Main Building. All students who have paid a library fee to the Bursar of the University are entitled to the privileges of the Library. Besides Reading Rooms the Building contains Departmental Studies, which may be used as study-rooms by honour students in the various branches and in which the Professors hold seminary courses, and private studies, intended for members of the Faculty or advanced students engaged in research work. The Library is opened at 8.45 every morning and remains open until 10 at night during the academic term. Books in ordinary use may not be taken out of the building during the daytime, but are lent for the night towards 5 p.m., to be returned the following morning before 10 o'clock. Books not in general demand may, on special application, be borrowed for a longer period. Failure to return a borrowed book at the proper time and other breaches of the regulations are punishable by fine or suspension from the privileges of the Library.

Rooms have been set apart in the Engineering, Mechanical, Chemistry and Mining and Electrical buildings for the housing of such periodicals and other literature of the University Library as is of special interest to the students of this faculty.

ROYAL ONTARIO MUSEUM

ARCHAEOLOGY, GEOLOGY, MINERALOGY, PALAEONTOLOGY, ZOOLOGY

Students of the University in all departments are recommended to avail themselves of the privileges of the Museum, which, although under separate control, is intimately connected with the work of the University.

The Museum is open on all week days from 10 a.m. to 5 p.m., and on Sundays from 2 p.m. to 5 p.m. The admission is free to the public on Tuesday, Thursday, Saturday and Sunday. On other days an admission fee of fifteen cents is charged.

By a resolution of the Board of Trustees all regular students of the University may be admitted free on all days of the week by presenting their card of registration.

UNIVERSITY OF TORONTO C.O.T.C.

The Toronto Contingent of the Canadian Officers Training Corps was organized in 1914, and is a unit of the non-permanent Active Militia. Its primary object is to provide students at Universities with a standardized measure of military training with a view to their qualifying for commissions in the country's auxiliary forces. C.O.T.C. Certificates of qualification exempt their holders from examination for commissioned rank on joining a militia unit in Canada, or, if resident in the British Islands, render them eligible for commissions in the Army Reserve of Officers, the Militia, or the Territorial Army.

The facilities which are offered by the contingent for obtaining a qualification while at the University, are intended to enable young gentlemen to give personal service to their country with the least possible interference with their civil careers, to ensure that units have their establishments complete in the junior commissioned ranks, and to build up an adequate reserve of scientifically trained officers who have completed a period of consecutive and systematic military training, on academic lines, of a nature calculated to produce good officers.

The contingent provides the practical work for students taking the Military Studies option for the Arts degree, as also physical exercise for students who may choose this as the form in which they will take their compulsory Physical Training. In addition to service in the corps for a University credit, students of any year or Faculty are trained in it to qualify for officers' certificates in the Infantry, Engineers, and Army Medical Corps, writing on the examinations set by the War Office for members of O.T.C. contingents throughout the Empire.

There are at present four companies—in the Faculties of Arts, Medicine and Applied Science—and the training of each is so arranged that on leaving the University students are qualified for commissions in that branch of the Militia to which their University course particularly applied.

The present Headquarters are at 184 College Street, and include armouries, members' reading room, library, and lecture rooms.

The Contingent's Staff is:

Officer Commanding..........Major T. R. Loudon, late Can. Eng., B.E.F.
Adjutant...................Capt. W. J. T. Wright, M.B.E.
Quartermaster...............Capt. W. G. C. Kenney, late R.A.V.C., B.E.F.
Paymaster..................Capt. T. A. Reed
Contingent Sergeant-Major....S-M. W. Hunt, late Royal Welch Fusiliers.

Officers of "C" (Applied Science) Company:

Officer Commanding..........Major J. R. Cockburn, M.C.
Second in Command..........
Subalterns..................

SOCIETIES

THE ENGINEERING SOCIETY OF THE UNIVERSITY OF TORONTO

Officers for 1925-1926

President	C. K. Lally
First Vice-President	P. C. Beam
Second Vice-President	W. H. M. Laughlin
Treasurer	F. A. Sievert
Secretary	M. R. Scriven
Curator	W. A. Duncan
Fourth Year President	E. R. Complin
Third Year President	A. C. Lee
Second Year President	J. M. C. Lazier
First Year President	J. L. Davenport
Civil Club Representative	W. H. Kribs
Mining and Metallurgical Club Representative	A. D. Dickson
Mechanical and Electrical Representative	C. E. Nugent
Architectural Club Representative	H. M. McLaughlin
Chemical Club Representative	J. D. Hawken
Debating Club Representative	E. G. Davies
Athletic Association Representative	C. A. Morrison

The Society meets every second Wednesday during the academic year (except April), beginning with the second Wednesday in October. Addresses are given by prominent men on subjects of general interest.

The Society is divided into six clubs for the purpose of affording a medium of study of matters relating in particular to different branches of Engineering. Each of the Clubs holds its meetings at regular intervals. Papers are read and discussions held on engineering subjects.

The Society publishes an annual, called "Transactions," which contains the addresses given at the meetings and an account of the year's activities.

A Supply Department is conducted by the Society on a co-operative plan, through which instruments, draughting supplies, stationery, etc., can be purchased at a low cost.

ATHLETIC ASSOCIATION

1925-1926

Hon. President	Prof. T. R. Loudon
President	C. A. Morrison
Vice-President	J. H. P. Russell
Secretary-Treasurer	H. Vernon
Fourth Year Representative	G. Rumble
Third Year Representative	G. L. B. Roberts
Second Year Representative	A. M. Grant
First Year Representative	H. Nimmo

The Athletic Association has full control over all athletic clubs using the name of the Faculty of Applied Science. The Executive Committee has power to suspend any one from the privileges of membership in the Association for any breach of its regulations, and controls the finances of all athletic clubs in the aforesaid Faculty. The annual membership fee of this Association is two dollars.

No other moneys are collected for the support of athletics in the Faculty of Applied Science without the sanction of the Executive Committee.

DEBATING CLUB

1925-1926

Hon. Chairman.................................Prof. A. R. Zimmer
Chairman.......................................E. G. Davies
Vice-Chairman..................................C. A. V. Armour
Secretary-Treasurer............................W. G. Raymore
Fourth Year Representative.....................C. A. Pollock
Third Year Representative......................G. B. Smith
Second Year Representative.....................M. Smith
First Year Representative.......................L. C. H. Jenkins

The Debating Club exists for the purpose of helping students to overcome their natural embarrassment when speaking in public and to that end holds weekly meetings during both terms, at which open debates take place after the manner of the Oxford Union.

THE INDUSTRIAL CHEMICAL CLUB

1925-1926

Hon. Chairman.................................Prof. J. W. Bain
Hon. Vice-Chairman.............................Prof. E. G. R. Ardagh
Chairman.......................................J. D. Hawken
Vice-Chairman..................................J. G. Anderson
Secretary-Treasurer............................G. R. Connor
Curator..W. D. Irwin
Fourth Year Representative.....................E. T. W. Bailey
Third Year Representative......................C. A. McMartin
Second Year Representative.....................W. C. Macdonald
First Year Representative.......................H. B. Barton

The object of the Chemical Club is to promote the study of industrial chemistry and chemical engineering. Illustrated lectures, preceded by an informal dinner and a short musical programme, are held fortnightly, and on the following day an excursion is made to industrial concerns located in the city or vicinity.

MECHANICAL AND ELECTRICAL ENGINEERING CLUB

1925-1926

Hon. Chairmen................Prof. R. W. Angus
Hon. Vice-Chairman...........Prof. A. R. Zimmer, Prof. J. H. Parkin
Chairman.....................C. E. Nugent
Vice-Chairman (Mechanical)....R. M. Gooderham
Vice-Chairman (Electrical)......B. Heron
Secretary-Treasurer............G. L. DeLaplante
Third Year Representative.......L. W. Barnes
Second Year Representatives.....B. G. Loscombe, C. E. McKinnon
First Year Representatives.......M. D. Jones, G. Rochereau de la Sablière

The Club meets during the academic year for the discussion of papers relating to mechanical and electrical engineering problems.

CIVIL ENGINEERING CLUB

1925-1926

Hon- Chairman..................Prof. P. Gillespie
Hon. Vice-Chairmen.............Prof. C. R. Young, Prof. T. R. Loudon
Chairman......................W. H. Kribs
Vice-Chairman..................D. G. McCrone
Secretary-Treasurer..............M. Smith
Fourth Year Representative.........H. F. Brown
Third Year Representative..........J. H. Connery
Second Year Representative.........W. A. Grunsten
First Year Representative...........P. W. Geldard
Varsity Representative.............

The Club is addressed during the academic year by practising engineers on modern methods and problems in civil engineering.

MINING AND METALLURGICAL CLUB

1925-1926

Chairman.........................A. D. Dickson
Vice-Chairman....................A. Wigle
Secretary-Treasurer.................W. C. Martin
Fourth Year Representatives..........W. S. Kirkpatrick, J. D. Barrington
Third Year Representative............K. C. Grogan
Second Year Representative...........L. A. Howard
First Year Representative.............G. M. Gray

The Club is the official organization representing the undergraduates of Departments 2 and 8 of the Faculty of Applied Science.

The objects of the Club are to promote the spirit of good fellowship and mutual assistance amongst its members, both graduate and undergraduate, to provide a means of meeting together, and for the discussion of pertinent topics.

ARCHITECTURAL CLUB

1925-1926

Hon. Chairman	Mr. J. H. Craig
Chairman	H. M. McLaughlin
Vice-Chairman	D. J. McLean
Secretary	Norman Gibson
Treasurer	R. S. Hanks
Graduate Representative	Prof. H. H. Madill
Third Year Representative	Miss E. M. Lalor
Second Year Representative	Gordon Adamson
First Year Representative	J. H. H. Collins

STUDENT CHRISTIAN ASSOCIATION

The Student Christian Association now carries on the work commenced by the Young Men's Christian Association in this Faculty in 1905. The aims of the Association are to develop true Christian manhood and to be of assistance to students. Bible study groups are conducted, conferences arranged and students are given help in finding suitable rooms, etc.

OFFICERS FOR 1925-1926

Hon. President	Prof. R. W. Angus
President	J. B. Beck
Vice-President	R. P. Quance
Secretary-Treasurer	D. S. Laidlaw
Convener of Study Groups	G. B. Smith

UNIVERSITY OF TORONTO STUDENTS' ADMINISTRATIVE COUNCIL

REPRESENTATIVES FROM ENGINEERING SOCIETY

President Engineering Society	C. K. Lally
Fourth Year Representative	E. R. Complin
Third Year Representative	A. C. Lee
Second Year Representative	J. M. C. Lazier
First Year Representative	J. L. Davenport

LODGING AND BOARD

Accommodation is readily obtainable in numerous private boarding-houses within convenient distance of the University, at a cost of from twelve dollars a week upwards for comfortable lodging with board; or rooms may be rented at a cost from six dollars a week upwards, and board obtained separately at about seven dollars per week. A list of accredited boarding-houses is kept by the Secretary of the Students' Christian Association, and students are recommended to consult him with reference to the selection of suitable accommodation.

UNIVERSITY RESIDENCES

By the generosity of the late E. C. Whitney, Esq., Mrs. Whitney and friends, the University offers to one hundred and fifty men the advantages of residential life and excellent accommodation within its own grounds. The Residence consists of three Houses situated on the north side of Hoskin Avenue, opening upon a quadrangle, the fourth side of which is formed by Devonshire Place. They stand about two hundred yards to the north of University College and close to Hart House. The buildings are known as the South, East and North Houses.

Each House contains twenty-four single rooms, one single suite, and eleven suites, a suite comprising a study and two bedrooms. Two large rooms in each building each with an open hearth have been set aside as a common rooms. A lavatory, with hot and cold shower baths is provided for every eight men. The buildings are heated by steam and lighted by electricity.

The University supplies the table, chairs, book-case, chiffonier, bed, mattress, pillows, linen and window shades for each room; it is prepared to furnish a desk lamp for a nominal rental.

The rates are $4.00 per week for a single room or half of a suite, and $5.00 per week for a single suite. The rental for the Michaelmas Term is payable in advance in one instalment, that for the Easter Term is payable in two instalments—$50.00 at the opening of the term and the balance on April 1st. These charges cover heat, light, house-service, house-laundry, and the use of the telephone. There is no separate dining hall connected with the Residence, but board may be obtained at the adjacent University Dining Hall in Hart House.

Except under very special circumstances occupants vacating during a term will forfeit the rent paid. Two weeks' notice must be given by those intending to leave at the end of the Michaelmas Term.

Applications for rooms must be made in writing to the Secretary of the Residence Committee (address the Registrar's Office) and must be accompanied by a deposit of $5.00. This deposit will be returned if the application be not granted, and will be forfeited if a room is assigned to the

applicant and not taken by him, unless notice of his refusal of the room be received by the Secretary in writing before September 15th. It will be returned in full at the end of the College year if the room key be given back and the room and furniture left in a satisfactory condition. The following principles govern the allotment of rooms: (i) No student who, as a result of the annual Spring examinations, is not assured of being able to proceed to a subsequent year, will be admitted into the Residence. Exception to this rule will be made in the case of a student in the Faculty of Medicine who has obtained standing at the May examination, but is debarred by the rules of that Faculty from proceeding to the subsequent year until he has passed his Supplemental examinations. Such a student will be assigned a room provisionally, but cannot occupy it unless he passes his Supplemental examinations in September. (ii) The rooms in each House will be distributed among the various Faculties and Years. (iii) A limited number of rooms will be reserved for members of the incoming First Year until September 12th. (iv) Applications will be considered in order of priority.

The University lays down three general rules, designed to prevent hazing, the use of intoxicants and gambling. The students in each House shall elect a House Committee, which is entrusted by the University with the making and enforcing of any other needed rules and with the maintenance of order. A member of the Faculty resides in each House to act as friend and adviser to the men in residence.

SUMMARY OF STUDENTS REGISTERED

Session 1925-1926

	Department							
Year	1	2	3	4	6	7	8	Total
I	17	12	19	12	31	31	4	126
II	20	11	20	7	18	30	1	107
III	21	5	24	10	18	38	3	119
IV	23	6	20	6	13	22	3	93
	81	34	83	35	80	121	11	445

UNIVERSITY OF TORONTO

CALENDAR OF THE FACULTY

OF

APPLIED SCIENCE AND ENGINEERING

1927-1928

UNIVERSITY OF TORONTO PRESS

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1927 CALENDAR 1927

JANUARY

Sun.		2	9	16	23	30
Mon.		3	10	17	24	31
Tues.		4	11	18	25	..
Wed.		5	12	19	26	..
Thur.		6	13	20	27	..
Fri.		7	14	21	28	..
Sat.	1	8	15	22	29	..

FEBRUARY

Sun.		6	13	20	27	
Mon.		7	14	21	28	
Tues.	1	8	15	22	..	
Wed.	2	9	16	23	..	
Thur.	3	10	17	24	..	
Fri.	4	11	18	25	..	
Sat.	5	12	19	26	..	

MARCH

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	31
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

APRIL

Sun.		3	10	17	24
Mon.		4	11	18	25
Tues.		5	12	19	26
Wed.		6	13	20	27
Thur.		7	14	21	28
Fri.	1	8	15	22	29
Sat.	2	9	16	23	30

MAY

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	31
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

JUNE

Sun.		5	12	19	26
Mon.		6	13	20	27
Tues.		7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	..
Sat.	4	11	18	25	..

JULY

Sun.		3	10	17	24	31
Mon.		4	11	18	25	..
Tues.		5	12	19	26	..
Wed.		6	13	20	27	..
Thur.		7	14	21	28	..
Fri.	1	8	15	22	29	..
Sat.	2	9	16	23	30	..

AUGUST

Sun.		7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	31
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

SEPTEMBER

Sun.		4	11	18	25
Mon.		5	12	19	26
Tues.		6	13	20	27
Wed.		7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	..

OCTOBER

Sun.		2	9	16	23	30
Mon.		3	10	17	24	31
Tues.		4	11	18	25	..
Wed.		5	12	19	26	..
Thur.		6	13	20	27	..
Fri.		7	14	21	28	..
Sat.	1	8	15	22	29	..

NOVEMBER

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	..
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

DECEMBER

Sun.		4	11	18	25
Mon.		5	12	19	26
Tues.		6	13	20	27
Wed.		7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	31

1928 CALENDAR 1928

JANUARY

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	31
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

FEBRUARY

Sun.		5	12	19	26
Mon.		6	13	20	27
Tues.		7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	..
Fri.	3	10	17	24	..
Sat.	4	11	18	25	..

MARCH

Sun.		4	11	18	25
Mon.		5	12	19	26
Tues.		6	13	20	27
Wed.		7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	31

APRIL

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	..
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

MAY

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	31
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

JUNE

Sun.		3	10	17	24	..
Mon.		4	11	18	25	..
Tues.		5	12	19	26	..
Wed.		6	13	20	27	..
Thur.		7	14	21	28	..
Fri.	1	8	15	22	29	..
Sat.	2	9	16	23	30	..

JULY

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	31
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

AUGUST

Sun.		5	12	19	26
Mon.		6	13	20	27
Tues.		7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	31
Sat.	4	11	18	25	..

SEPTEMBER

Sun.		2	9	16	23	30
Mon.		3	10	17	24	..
Tues.		4	11	18	25	..
Wed.		5	12	19	26	..
Thur.		6	13	20	27	..
Fri.		7	14	21	28	..
Sat.	1	8	15	22	29	..

OCTOBER

Sun.		7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	31
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

NOVEMBER

Sun.		4	11	18	25
Mon.		5	12	19	26
Tues.		6	13	20	27
Wed.		7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	..

DECEMBER

Sun.		2	9	16	23	30
Mon.		3	10	17	24	31
Tues.		4	11	18	25	..
Wed.		5	12	19	26	..
Thur.		6	13	20	27	..
Fri.		7	14	21	28	..
Sat.	1	8	15	22	29	..

CALENDAR OF THE FACULTY OF APPLIED SCIENCE AND ENGINEERING 1927-1928

Michaelmas Term

1927—July 1	Friday	Dominion Day. University Buildings closed.
Aug. 13	Saturday	Students third year, Dept. 1, report at Summer Survey Camp.
Aug. 20	Saturday	Students third year, Dept. 2, report at Summer Survey Camp.
Sept. 1	Thursday	Last day for receiving applications for supplemental examinations.
Sept. 5	Monday	Labour Day. University Buildings closed.
Sept. 8	Thursday	Students fourth year, Astronomy Option, report at Summer Survey Camp.
Sept. 21	Wednesday	Supplemental examinations commence.
Sept. 26	Monday	Registration in person of the first year from 9.00 a.m. to 5.00 p.m.
		Meeting of Faculty Council.
Sept. 27	Tuesday	Registration in person of the second, third and fourth years from 9.00 a.m. to 5.00 p.m.
		Preliminary instruction to first year.
		The Dean's address to the first year at 9.30 a.m. in the first year draughting room.
		Classification Tests in first year.
Sept. 28	Wednesday	The opening address by the President to the students of all Faculties at 3.00 p.m. in Convocation Hall.
		Lectures and Laboratory work commence at 8.00 a.m.
		Last day for handing in Vacation Work.
Oct. 1	Saturday	Stated meeting of the Caput to deal with requests as to social functions until November 15.
Oct. 5	Wednesday	Inaugural meeting of Faculty Council.
Oct. 6-9	Thursday-Sunday	Celebration of the Centenary of the granting of the charter of King's College, Toronto.
Oct. 7	Friday	Interfaculty Track Meet.
Oct. 14	Friday	Meeting of Senate.
Oct. 19	Wednesday	First meeting of Engineering Society.
Oct. 21	Friday	Meeting of Faculty Council (Reports of Committees).

1927—Nov. 2 Wednesday. . Meeting of Engineering Society.
Nov. 4 Friday. . . . . . Meeting of Faculty Council.
Nov. 11 Friday. . . . . . Armistice Day. Memorial Service at the Soldiers' Tower at 11.00 a.m. Neither lectures nor laboratory classes given from 10.00 a.m. to 12 noon.
Meeting of Senate.
Nov. 12-14 Saturday-Monday—Thanksgiving. Neither lectures nor laboratory classes given.
Nov. 16 Wednesday. . Meeting of Engineering Society.
Nov. 30 Wednesday. . Meeting of Engineering Society.
Dec. 1 Thursday. . . . Last day for receiving applications for supplemental examinations.
Dec. 2 Friday. . . . . . Meeting of Faculty Council.
Dec. 9 Friday. . . . . . Meeting of Senate.
Dec. 14 Wednesday. . Meeting of Engineering Society.
Dec. 21 Wednesday. . Last day of lectures. Term ends at 1.00 p.m.
Dec. 26 Monday. . . . . University Buildings closed.

Easter Term

1928—Jan. 2 Monday. . . . . University Buildings closed.
Jan. 4 Wednesday. . Mid-session examinations commence.
Easter Term begins. Lectures commence at 9.00 a.m.
Jan. 6 Friday. . . . . . Meeting of Faculty Council.
Jan. 11 Wednesday. . Meeting of Engineering Society.
Jan. 13 Friday. . . . . . Meeting of Senate.
Jan. 20 Friday. . . . . . Meeting of Faculty Council (Examination results).
Jan. 25 Wednesday. . Meeting of Engineering Society.
Feb. 3 Friday. . . . . . Meeting of Faculty Council.
Feb. 8 Wednesday. . Meeting of Engineering Society.
Feb. 10 Friday. . . . . . Meeting of Senate.
Feb. 22 Wednesday. . Meeting of Engineering Society.
Mar. 1 Thursday. . . . Last day for receiving applications for supplemental examinations.
Mar. 2 Friday. . . . . . Meeting of Faculty Council.
Mar. 7 Wednesday. . Meeting of Engineering Society (Nomination Meeting).
Mar. 9 Friday. . . . . . Meeting of Senate.
Annual Elections, Engineering Society.
Mar. 16 Friday. . . . . . Annual General Meeting, Engineering Society.

1928—Apr.	4	Wednesday..	Easter Term ends. Lectures and laboratory work end at 5.00 p.m.
Apr.	5	Thursday....	Meeting of Faculty Council.
Apr.	6-9	Friday-Monday—	Easter. Neither lectures nor laboratory classes given.
Apr.	10	Tuesday.....	Annual examinations commence.
Apr.	13	Friday......	Meeting of Senate.
May	2	Wednesday..	Meeting of Faculty Council (Examination results).
May	4	Friday......	Meeting of Faculty Council.
May	11	Friday......	Meeting of Senate.
May	24	Thursday....	Victoria Day. University Buildings closed.
June	6	Wednesday..	Meeting of Senate.
June	7	Thursday....	University Commencement.

UNIVERSITY OF TORONTO

ADMINISTRATIVE OFFICERS OF THE UNIVERSITY

THE UNIVERSITY

President........SIR ROBERT ALEXANDER FALCONER, K.C.M.G., D.LITT. LL.D., D.D., D.C.L., OXON.
Registrar..............................JAMES BREBNER, B.A., LL.D.
Bursar........................FERDINAND ALBERT MOURÉ, MUS.DOC.
Librarian.........................WILLIAM STEWART WALLACE, M.A.
Superintendent of Buildings and Grounds..ARTHUR D'ORR LE PAN, B.A.SC.
Director of Extension Work and Publicity..WILLIAM JAMES DUNLOP, B.A.
Warden of Hart House..............JOHN BURGON BICKERSTETH, M.A.
Director of University Health Service.......GEORGE DANA PORTER, M.B.
Medical Adviser for Women Students...MISS EDITH GORDON, B.A., M.B., D.P.H.
Manager of the University of Toronto Press....RICHARD J. HAMILTON, B.A.

FACULTY OF APPLIED SCIENCE AND ENGINEERING

President.......................SIR ROBERT A. FALCONER, K.C.M.G.
Dean of Faculty..CHARLES H. MITCHELL, C.B., C.M.G., C.E., LL.D., D.Eng.
Secretary of Faculty...................W. STEWART WILSON, B.A.SC.

E. A. ALLCUT, M.Sc. (Birmingham), M.I.Mech.E. 50 St. George St. 5
Associate Professor of Mechanical Engineering.

G. R. ANDERSON, M.A. (Tor. & Harvard), M.I.E.S. 7 Rose Park Cresc. 5
Professor of Engineering Physics and Photography.

R. W. ANGUS, B.A.Sc., M.A.S.M.E. Mechanical Building 5
Professor of Mechanical Engineering.

E. G. R. ARDAGH, B.A.Sc., F.C.I.C. 148 Howard Park Ave. 3
Associate Professor of Chemical Engineering.

E. R. ARTHUR, B.Arch., M.A. (Liverpool), A.R.I.B.A. 158 Albany Ave. 4
Assistant Professor of Architecture.

J. W. BAIN, B.A.Sc., F.I.C. 393 Brunswick Ave. 4
Professor of Chemical Engineering.

E. W. BANTING, B.A.Sc. 101 Farnham Ave. 5
Assistant Professor of Surveying.

M. C. BOSWELL, B.A.Sc., M.A. (Tor. & Harv.), Ph.D. Mining Bldg. 5
Professor of Organic Chemistry (in Chemical Engineering).

J. R. COCKBURN, M.C., B.A.Sc., M.E.I.C. 100 Walmer Rd. 4
Professor of Descriptive Geometry.

S. R. CRERAR, B.A.Sc., D.L.S. 122 Grenadier Rd. 3
Associate Professor of Surveying.
F. C. DYER, B.A.Sc., M.E.I.C. 233 Ashworth Ave. 4
Assistant Professor of Mining Engineering.
P. GILLESPIE, B.A.Sc., M.Sc. (McGill), C.E., M.E.I.C. 358 Davenport Rd. 5
Professor of Civil Engineering.
G. A. GUESS, M.A. (Queen's) Oakville, Ont.
Professor of Metallurgical Engineering.
H. E. T. HAULTAIN, C.E., M.E.I.C. 156 Glencairn Ave. 12
Professor of Mining Engineering.
J. T. KING, B.A.Sc. 126 Manor Rd. E. 12
Assistant Professor of Mining Engineering.
A. T. LAING, B.A.Sc. 146 Balmoral Ave. 5
Associate Professor of Highway Engineering.
T. R. LOUDON, B.A.Sc., M.E.I.C. 189 Sheldrake Blvd. 12
Professor of Applied Mechanics.
H. H. MADILL, B.A.Sc., M.R.A.I.C. 1344 Mount Pleasant Rd. 12
Assistant Professor of Architecture.
R. J. MONTGOMERY, Cer.E. (Ohio). 46 Atlas Ave. 10
Assistant Professor of Ceramics.
J. A. NEWCOMBE, B.Sc. (London), A.R.S.M. 2215 Gerrard St. E. 13
Assistant Professor of Metallurgy.
J. H. PARKIN, M.E., F.R.Ae.S. 12 Hudson Drive, 5
Associate Professor of Mechanical Engineering.
H. W. PRICE, B.A.Sc. 474 Palmerston Blvd. 4
Professor of Electrical Engineering.
T. R. ROSEBRUGH, M.A. 92 Walmer Rd. 4
Professor of Electrical Engineering.
W. J. SMITHER, B.A.Sc., M.E.I.C. 74 St George St. 5
Assistant Professor of Structural Engineering.
L. B. STEWART, D.T.S. 38 St. Germain Ave., 12
Professor of Surveying and Geodesy.
R. TAYLOR, B.A.Sc. 6 Burnside Dr., 10
Assistant Professor of Mechanical Engineering.
J. E. TOOMER, B.S. (North Carolina State). 128 Albany Ave. 4
Assistant Professor of Metallurgy.
W. M. TREADGOLD, B.A. 13 Woodlawn Ave. E. 5
Associate Professor of Surveying.
C. H. C. WRIGHT, B.A.Sc., M.R.A.I.C. 419 Markham St. 4
Professor of Architecture.
W. J. T. WRIGHT, M.B.E., B.A.Sc. 126 Melrose Ave. 12
Assistant Professor of Engineering Drawing.
C. R. YOUNG, C.E., M.E.I.C. 98 Hilton Ave. 10
Professor of Structural Engineering.
A. R. ZIMMER, B.A.Sc. 80 Pine Crest Rd. 9
Assistant Professor of Electrical Engineering.

SESSIONAL APPOINTMENTS

C. A. V. ARMOUR, B.A.Sc. — 11 Spencer Ave. 3
Demonstrator in Hydraulics.

L. J. BONHAM, B.A.Sc. — 46 Gloucester St. 5
Demonstrator in Chemical Engineering.

R. J. BROWN, B.A.Sc. — 21 Glen Gordon Rd, 9
Demonstrator in Electrical Engineering.

D. BRUCE, B.A.Sc. — 146 Woodington Ave. 13
Demonstrator in Electrical Engineering.

J. G. CADE, B.A.Sc. — 243 Major St. 4
Demonstrator in Machine Design.

A. R. CLUTE, B.A., LL.B. — 47 Elgin Ave. 5
Special Lecturer in Limited Companies and Commercial Law.

F. COATES, A.R.C.A. — Scarboro Bluffs P.O.
Instructor in Modelling.

W. R. COWAN, B.A.Sc. — 216 Cottingham St. 5
Demonstrator in Engineering Drawing.

T. L. CROSSLEY — 28 Lonsdale Rd. 5
Special Lecturer in Pulp and Paper.

A. V. DELAPORTE, B.A.Sc. — 5 Millerson Ave. 10
Instructor in Sanitary Chemistry.

W. B. DUNBAR, B.A.Sc. — 241 Glebeholme Blvd. 6
Lecturer in Engineering Drawing.

J. P. DUNCAN, B.A.Sc. — 7 Spadina Rd. 4
Demonstrator in Thermodynamics.

H. B. DUNNINGTON-GRUBB, B.S.A. (Cornell) — 4 St. Thomas St. 5
Special Lecturer in Landscape Architecture.

G. R. EDWARDS, B.A.Sc. — 1263 King St. W. 3
Demonstrator in Engineering Drawing.

W. F. ELLIOT, B.A.Sc. — 133 Walmer Rd. 4
Demonstrator in Electrical Engineering.

W. S. FERGUSON — 28 Kilbarry Rd. 5
Special Lecturer in Accountancy and Business.

W. H. GREAVES, M.A. (Bost.) — Victoria Coll. 5
Special Lecturer in Public Speaking.

W. S. GUEST, B.A.Sc. — 30 McMaster Ave. 5
Lecturer in Electrical Engineering.

C. G. HEARD, B.A.Sc. — 350 Markham St. 4
Demonstrator in Thermodynamics.

G. I. HOOVER, M.A., Ph.D. (Cantab.) — 586 Spadina Ave. 4
Demonstrator in Chemical Engineering.

C. A. HUGHES, M.M., M.A.Sc. — 305 Mossom Rd. 3
Instructor in Applied Mechanics.

K. B. JACKSON, B.A.Sc. — 365 Hillsdale Ave., E. 12
Lecturer in Engineering Physics and Photography.

C. W. JEFFERYS, R.C.A., O.S.A. York Mills
Instructor in Painting.

P. V. JERMYN, B.A.Sc. 109 Collier St. 5
Instructor in Engineering Drawing.

R. S. KERR, M.A.Sc. 46 Macpherson Ave. 5
Demonstrator in Electrical Engineering.

R. E. LAIDLAW, B.A.Sc. 77 Glendonwynne Rd. 9
Special Lecturer in Engineering Law.

MISS J. C. LAING, B.A. 221A St. Clair Ave. W. 5
Instructor in History in Dept. of Architecture.

J. J. MAGILL, B.A.Sc. 91 St. George St. 5
Demonstrator in Electrical Engineering.

A. S. MATHERS, B.A.Sc. 474 Avenue Road 5
Special Instructor in Architecture

H. L. MCCLELLAND, B.A.Sc. 38 Kenneth Ave. 9
Demonstrator in Mining Engineering.

R. J. MCGRATH, B.A.Sc. 58 Triller Ave. 3
Demonstrator in Engineering Physics and Photography.

W. G. MCINTOSH, B.A.Sc. 360 Rosewell Ave. 12
Lecturer in Machine Design.

J. W. MELSON, B.A.Sc. 69 Walmsley Blvd. 5
Lecturer in Surveying.

H. MILLER, B.A.Sc. 40 College St. 2
Demonstrator in Engineering Drawing.

D. D. MOSSMAN, B.Sc. (McGill) M.A. 29 Isabella St. 5
Demonstrator in Chemical Engineering.

R. E. K. NEELANDS, B.A.Sc. 325 Davenport Rd. 5
Demonstrator in Engineering Drawing.

J. MURRAY ROBERTSON, B.A.Sc. 261 St. Germain Ave. 12
Lecturer in Technical English.

R. M. ROBERTSON, B.A.Sc. 53 Castle Frank Rd. 5
Demonstrator in Hydraulics.

W. L. SAGAR, B.A.Sc. 306 Jarvis St. 2
Instructor in Applied Mechanics.

J. E. B. SHORTT, B.A.Sc. 401 Quebec Ave. 9
Instructor in Mechanical Engineering.

F. E. SIMPSON. 14 Lakeview Ave. 3
Assistant in Modelling.

G. W. SMART, B.A.Sc. 71 Howland Ave. 4
Demonstrator in Electrical Engineering.

E. A. SMITH, M.A. 113½ Soudan Ave. 12
Lecturer in Chemical Engineering.

C. I. SOUCY, B.A.Sc. 48 Moore Ave. 5
Lecturer in Electrical Engineering.

J. J. SPENCE 63 Stibbard Ave. 12
Demonstrator in Engineering Drawing.

A. S. TOWNSHEND, M.Sc. (Queen's), M.A. — 225 Robert St. 4
Demonstrator in Chemical Engineering.

A. WARDELL, B.A.Sc. — 122 Melrose Ave. 12
Demonstrator in Engineering Drawing.

E. B. WEIR, B.Sc. — 66 Sussex Ave. 4
Demonstrator in Mining Engineering.

D. D. WHITSON, B.A.Sc. — 617 Huron St. 5
Demonstrator in Engineering Drawing.

A. C. WILSON, B.A.Sc. — 283 Evelyn Ave. 9
Instructor in Engineering Drawing.

M. H. WOLSEY, B.A.Sc. — 25 Lowther Ave. 5
Demonstrator in Electrical Engineering.

F. B. YEATS, B.A.Sc. — 26A Gloucester St. 5
Demonstrator in Electrical Engineering.

MEMBERS OF OTHER FACULTIES GIVING INSTRUCTION TO STUDENTS IN APPLIED SCIENCE

S. Beatty, M.A., Ph.D., *Professor of Mathematics.*	537 Markham St. 4
M. A. Buchanan, B.A., Ph.D., *Professor of Italian and Spanish.*	75 Heathdale Road 10
J. T. Burt-Gerrans, Phm.B., M.A., Ph.D. *Associate Professor of Electrochemistry.*	46 Dewson St. 4
J. H. Cameron, M.A., *Professor of French.*	96 Admiral Road 5
A. T. DeLury, M.A., *Professor of Mathematics.*	74 St. Albans St. 5
G. H. Duff, M.A., Ph.D., *Assistant Professor of Plant Physiology.*	325 Kendal Ave. 10
B. Fairley, M.A., Ph.D., *Associate Professor of German.*	197 Dawlish Ave. 12
C. R. Fay, M.A., D.Sc., *Professor of Economic History.*	374 Brunswick Ave. 4
J. G. Fitzgerald, M.D., *Professor of Hygiene and Preventive Medicine.*	186 Balmoral Ave. 5
D. T. Fraser, M.B., D.P.H., *Assistant Professor of Hygiene and Preventive Medicine.*	190½ Lowther Ave. 4
T. Hedman, Ph.B., *Assistant Professor of German.*	Old Forest Hill Road
G. E. Holt, M.A., Mus.Bac., *Assistant Professor of German.*	20 Nanton Ave. 5
F. B. Kenrick, M.A., Ph.D., *Professor of Chemistry.*	77 Lonsdale Road 5
W. J. Loudon, B.A., *Professor of Mechanics.*	9 Woodlawn Ave. E. 5
J. W. MacArthur, M.A., Ph.D., *Assistant Professor of Genetics.*	319 Roehampton Ave. 12
M. A. Mackenzie, M.A., F.I.A., *Professor of Mathematics.*	1 Bellwoods Park 3
A. MacLean, B.A., *Associate Professor of Geology.*	60 St. George St. 5
W. L. Miller, B.A., Ph.D., *Professor of Physical Chemistry.*	8 Hawthorne Ave. 5
E. S. Moore, M.A., Ph.D., *Professor of Economic Geology.*	53 Hewitt Ave. 3
G. H. Needler, B.A., Ph.D., *Professor of German.*	103 Bedford Road 5

W. A. PARKS, B.A., Ph.D., *Professor of Geology.*	**69 Albany Ave. 4**
A. L. PARSONS, B.A., *Associate Professor of Mineralogy.*	79 Oriole Road 5
I. R. POUNDER, M.A., Ph.D., *Associate Professor of Mathematics.*	19 Glen Gordon Rd. 9
L. J. ROGERS, B.A.Sc., M.A., *Associate Professor of Chemistry.*	110 Garfield Ave. 5
H. B. SPEAKMAN, M.Sc., *Associate Professor of Zymology.*	61 Walmsley Blvd. 5
T. L. WALKER, M.A., Ph.D., *Professor of Mineralogy and Petrography.*	**20 Avondale Ave. 5**
R. K. YOUNG, B.A., Ph.D. *Associate Professor of Astronomy.*	96 Isabella St. 5

SESSIONAL APPOINTMENTS

F. M. ARCHIBALD, B.Sc. (McGill) *Assistant in Electrochemistry.*	North House, U. of T. 5
L. A. BIBET, *Instructor in French.*	31 Charles St W. 5
W. E. GRAHAM, M.A. *Assistant in Electrochemistry.*	126 Lennox St. 4
H. W. HILBORN, B.A., *Lecturer in Italian and Spanish.*	37 Charles St. W. 5
W. A. IRVINE, B.A.Sc. *Assistant in Electrochemistry.*	315 Willard Ave. 3
I. W. JONES, B.A., B.Sc., (Alb.) *Class Assistant in Geology.*	76 St. Mary St. 5
D. E. KERR-LAWSON, B.A., *Demonstrator in Mineralogy.*	99 Bedford Rd. 5
MISS J. C. LAING, B.A., *Instructor in History and French.*	221A St. Clair Ave W. 5
D. A. F. ROBINSON, M.A. *Lecturer in Mathematics.*	302 Heath St. E. 5

FACULTY OF APPLIED SCIENCE AND ENGINEERING

Historical Sketch

The Legislative Assembly of the Province of Ontario during the Session of 1877 gave its sanction to the establishment of a School of Practical Science on the basis proposed in the memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council on the 3rd day of February, 1877.

By the scheme thus approved the Government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the department of science, above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction of the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor on the 30th day of October, 1889.

By an Order-in-Council, approved by the Lieutenant-Governor on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School. By the terms of this order the management and discipline of the School was vested in the Council.

On December 14th, 1900, the Senate by Statute, subsequently approved by the Lieutenant-Governor in Council, established a Faculty of Applied Science and Engineering but without assuming any liability for its support or maintenance. Under this Statute the teaching Staff and Examiners of the School of Practical Science became the teaching Staff and Examiners of the Faculty, although the University retained the right to appoint the Examiners for the Bachelor of Applied Science and professional degrees. By the University Act of 1906 the School of Practical Science became the Faculty of Applied Science and Engineering of the University of Toronto.

On April 8th, 1892, the Senate of the University established the Degree of B.A.Sc., which was open to those who held the Diploma of the School and were prepared to devote a fourth year to advanced work. In the Session 1909-1910 a new Course extending over four years and leading to the Degree of B.A.Sc. came into operation, taking the place of the long established Diploma Course of three years, which came to an end in the Session 1910-1911.

MATRICULATION

A candidate for admission to the First Year in the Faculty of Applied Science and Engineering must produce satisfactory certificates of good character and of having completed the seventeenth year of his age on or before the first of October of the year in which he proposes to register.

He must also present certificates giving him credit in the following subjects of Pass and Honour Matriculation:

PASS MATRICULATION

ENGLISH (Literature and Composition)
HISTORY (British and Ancient)
MATHEMATICS (Algebra and Geometry)
Any three of:
LATIN (Authors and Composition)
GREEK (Authors and Composition)
FRENCH (Authors and Composition)
GERMAN (Authors and Composition)
{SPANISH (Authors and Composition) *or*
{ITALIAN (Authors and Composition)
{EXPERIMENTAL SCIENCE (Physics and Chemistry) *or*
{AGRICULTURE (Parts I and II)

*Arithmetic *and* Certificates in Mechanical Drawing and shop work from the Principal of the School, accompanied by an approving certificate from the Director of the Technical School Branch of the Department of Education for Ontario.

HONOUR MATRICULATION

(At least 50%)

ENGLISH (Literature and Composition).
MATHEMATICS (Algebra, Geometry and Trigonometry).
One of:
LATIN (Authors and Composition).
GREEK (Authors and Composition).
FRENCH (Authors and Composition).
GERMAN (Authors and Composition).
SPANISH (Authors and Composition).
ITALIAN (Authors and Composition).

In selecting the options it is recommended that students take French, German and Experimental Science. In the Department of Architecture, French is recommended, in the Departments of Chemical Engineering and Mechanical Engineering it is desirable that students take German. For

*This option applies to students—and to such students only—who have been in attendance at and matriculate from a Technical School in the Province of Ontario and certified as such by the Department of Education of the Province.

students intending to take Metallurgical Engineering, Spanish and Experimental Science are recommended.

The regulations respecting Matriculation, together with a schedule of examinations which may be accepted as equivalent, may be found in the Curriculum for Matriculation on application to the Registrar of the University.

A candidate from the British Isles must present a certificate showing that he has passed or has exemption from the Preliminary Examination of the Institution of Civil Engineers.

ADMISSION

Applications for admission must be made on blank forms supplied by the Registrar, and should be forwarded as early as possible to the Registrar of the University, together with all Pass and Honour Matriculation or equivalent certificates.

Applications based upon certificates other than those mentioned will be considered as occasion may require. Such certificates must be accompanied by an official statement of the marks in the various subjects upon which the certificate was granted.

ADMISSION *AD EUNDEM STATUM*

An undergraduate of another University may be admitted *ad eundem statum* on such conditions as the Senate on the recommendation of the Council of the Faculty may prescribe.

An applicant for admission *ad eundem statum* must submit with his petition (1) a calendar of his University giving a full statement of the courses of instruction; (2) an official certificate of character and academic standing.

REGISTRATION

Students in any year will be required to register in person on the date specified in the Calendar for the registration of students in that year. Those who present themselves on subsequent days must petition the Council to be allowed to register. Every petition for registration subsequent to the said date must be accompanied by a sum of money reckoned at one dollar per diem for each day thereafter. For sufficient cause the whole or part of such a sum may be refunded.

Council reserves the right to reject applications of, or impose penalties upon, those who fail to report on the dates specified. It is important that students should be in attendance in the laboratories and at lectures from the date of registration.

ENQUIRIES

Enquiries with reference to requirements of admission to the Faculty of Applied Science and Engineering are to be addressed to the Registrar of the University.

Communications relating to curricula, instruction, examinations and standing therein, in the Faculty of Applied Science and Engineering are to be addressed to the Secretary of the Faculty.

DEGREES

Degree of Bachelor of Applied Science (B.A.Sc.)

Degree of Bachelor of Architecture (B.Arch.)

There are six graduating Departments leading to the Degree of Bachelor of Applied Science (B.A.Sc.) and one graduating Department leading to the Degree of Bachelor of Architecture (B.Arch.), viz.,

1. Civil Engineering.
2. Mining Engineering.
3. Mechanical Engineering.
4. Architecture.
5. (Discontinued.)
6. Chemical Engineering.
7. Electrical Engineering.
8. Metallurgical Engineering.

Prescription of the courses in these Graduating Departments are given on pages 42, 47, 50, 53, 56, 59, 62.

In the fourth year, optional courses are arranged in certain departments. Students are required to submit their selection to the Secretary in writing, not later than September 15th. The proposed selection must be approved by Council before adoption.

Degree of Master of Applied Science (M.A.Sc.)

Degree of Master of Architecture (M.Arch.)

Graduates holding the Degree of B.A.Sc. of this University or those holding the degree of another University recognized as equivalent, may take post-graduate work proceeding to the Degree of Master of Applied Science (M.A.Sc.). (For requirements, see page 111.)

Graduates holding the Degree of B.Arch. or B.A.Sc. in Architecture of this University, or those holding the Degree of another University recognized as equivalent, may take post-graduate work proceeding to the Degree of Master of Architecture (M.Arch.). (For requirements, see p. 111.)

Professional Degrees

Graduates in Applied Science and Engineering, and graduates of the School of Practical Science, may, after three years spent in professional work, present themselves for the degrees of Civil Engineer (C.E.), Mining. Engineer (M.E.), Mechanical Engineer (M.E.), Electrical Engineer (E.E.), Chemical Engineer (Chem. E.), Metallurgical Engineer (Met. E.), as the case may be, subject to the rules and regulations established by the University. (See page 111.)

FEES

All fees are payable at the Bursar's office between the hours 10 a.m. and 1 p.m. of each week day except Saturday (or may be remitted by mail).

The annual fees, including tuition, library, laboratory supplies and one annual examination for each year, shall be as follows:

If paid in full on or before November 5th	$150.00
If paid by instalments.—	
First instalment, if paid on or before November 5th	75.00
Second instalment, if paid on or before February 5th	78.00
Repeating the year—If paid in full on or before November 5th	75.00

The above fees are payable in advance. After November 5th a penalty of $1.00 per month will be imposed until the whole amount is paid. In the case of payment by instalments the same rule as to penalty will apply.

Students must have paid the fees due in the first term before proceeding to the work of the second term.

GENERAL FEES

Matriculation, or registration of Matriculation	$ 5.00
Supplemental examination	10.00
Admission *ad eundem statum*	10.00
Degree of B.A.Sc. (Payable Apr. 1st)	10.00
Degree of B. Arch. (Payable Apr. 1st)	10.00
Physical Training (see page 23)	5.00
Supplemental Physical Training (see page 23)	10.00
Hart House (see below)	8.00
Students' Administrative Council (see page 23)	4.00

DUES AND DEPOSITS

All dues and deposits are payable at the office of the Faculty at the time of Registration. Cheques must be made out in favour of "Faculty of Applied Science and Engineering".

Engineering Society membership	$2.00
Athletic Association membership	2.00
Annual deposit, Departments 1, 3, 4, 7	3.00
Departments 2, 6, 8	8.00

Charges for waste, neglect and breakage are to be met out of the deposit fee, the balance of which will be refunded to the student at the end of the session on application to the Secretary.

If the foregoing deposits do not cover the cost of breakage due to carelessness or neglect, the balance shall be paid by the student to the Secretary.

HART HOUSE FEE

Every male student in attendance, proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering, is required to pay to the Bursar before December 1st the annual fee of eight dollars for the

maintenance of Hart House. If this fee is not paid by the above date a penalty of two dollars will be imposed, making the total fee ten dollars.

STUDENTS' ADMINISTRATIVE COUNCIL FEE

Every student in attendance, proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering, is required to pay to the Bursar at the time of the entry of his name with the Secretary the annual fee of four dollars for the support of the Students' Administrative Council.

PHYSICAL TRAINING FEE

Every male student in attendance proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering is required to pay to the Bursar the annual Physical Training fee of $5.00 at the opening of each session in which Physical Training is compulsory for that student.

A student who has failed to complete satisfactorily the course in Physical Training prescribed for the First Year will not be permitted to register in the Third Year; and the student who has failed to complete satisfactorily the course in Physical Training prescribed for the Second Year will not be permitted to register in the Fourth Year.

Every student who has neglected to complete satisfactorily the course in Physical Training of the First or Second Year, and who must take this work during the Second or Third Year respectively of his course, will be required to pay to the Bursar at the opening of the session a Supplemental Fee of $10.00, in addition to the prescribed Physical Training fee.

SCHOLARSHIPS AND PRIZES

Through the generosity of friends of the University, encouragement has been given to both undergraduate and graduate work in the various branches, by establishing the following scholarships and prizes:

Name of Scholarship	Years Eligible	Amount	Described on page
Mrs. M. W. Baptie................	I	$100	24
Harvey Aggett....................	II	$ 75	24
Boiler Inspection & Insurance Co....	III	$150	24
Jenkins Brothers, Limited..........	III	$100	24
Toronto Architectural Guild........	IV	....	25
B.A.A.S. Medal..................	IV	....	25
C. J. Rhodes.....................	II, III, IV	£300	25
Khaki University & Y.M.C.A.......	II, III, IV	Loans	27
Jardine Memorial.................	All	$100	27
F. W. Jarvis Bursaries	All	$50	27
S. Ubukata.......................	All	....	27
U. of T. War Memorial............	All	$250	28
Æneas McCharles.................	All & Grad.	$1,000	28
1851 Exhibition..................	Graduate	£250	29
Nipissing Mining Co...............	Graduate	$1,100	31

THE BAPTIE SCHOLARSHIP

The Baptie Scholarship is derived from a bequest under the will of the late Mrs. Margaret W. Baptie, of Ottawa, and the Board of Governors has directed that from the income therefrom a scholarship of One Hundred Dollars shall be awarded for Engineering students on the record of their first year. . . . The Board of Governors also authorizes a remission of fees in the case of the holder of the scholarship up to Seventy-five Dollars.

The conditions of the award are as follows: That the scholarship be awarded to the student who, in the Annual Examinations of the First Year, enrolled in any one of the departments of Civil Engineering, Mining Engineering, Mechanical Engineering, Chemical Engineering, Electrical Engineering or Metallurgical Engineering, obtains the highest aggregate percentage of marks in those subjects which are common to the First Year curricula of those departments. The first award is to be made on the results of the Annual Examinations of the Session 1925-26.

HARVEY AGGETT MEMORIAL SCHOLARSHIP

This scholarship was donated by Mr. J. T. Aggett, of Toronto, as a perpetual memorial to his son, the late Lieutenant Harvey Aggett, who enlisted in March, 1915, during his second year in this Faculty, and was killed in action at Passchendaele on 6th November, 1917.

This annual scholarship of the value of seventy-five dollars is to be awarded to a student of the second year in this Faculty who, obtaining honours and being one of the first three in his year by his standing at the annual examinations, has been adjudged highest of the three in general student activities and service in the University during his period of attendance.

BOILER INSPECTION AND INSURANCE COMPANY SCHOLARSHIP

The Boiler Inspection and Insurance Company of Canada offers a Scholarship in the Department of Mechanical Engineering of the value of $150.00 to the student who obtains highest Honour Standing in the regular examinations of the third year.

The successful candidate will be expected to proceed to his fourth year during the session next following the date of the award.

The amount of the award will be credited by the Bursar to the fees of the fourth year of the successful candidate.

JENKINS SCHOLARSHIP IN ENGINEERING

The Jenkins Scholarship in Engineering, presented by Jenkins Bros., Limited, has been donated to continue for a period of five years, the first award to be made in 1925.

This annual scholarship, of the value of One Hundred Dollars, is to be awarded to the student of the third year registered in one of the six departments of Civil, Mining, Mechanical, Chemical, Electrical or Metallurgical Engineering, who has the highest aggregate of percentages for the first, second and third years, relative to the requirements of his department.

Toronto Architectural Guild Medal

The Toronto Architectural Guild was the organization of local architects from which sprung the Ontario Association of Architects. When the new and wider association became firmly established, the Guild disbanded and handed over to a trustee board certain funds for the establishment of a Medal to be awarded in the Department of Architecture of the University of Toronto.

The Trustee Board, now that the fund has accumulated considerably, announces its intention of awarding this medal annually to a senior student showing outstanding ability in Architectural Design.

Medal from Members of the British Association for the Advancement of Science

A Bronze Medal has been donated for students of the Faculty of Applied Science and Engineering by members of the British Association for the Advancement of Science. This Medal will be awarded to the student of the Fourth Year, in any department, who, taking honours, obtains the highest aggregate percentage, in practical and written examinations in the year.

The Rhodes Scholarship

The trustees of the late Mr. C. J. Rhodes have assigned two of the Rhodes Scholarships to the Province of Ontario.

These scholarships will hereafter be thrown into open competition in the Province, subject to the following conditions:—

1. Candidates must be British subjects, with at least five years' domicile in Canada, and unmarried. They must have passed their nineteenth, but not have passed their twenty-fifth birthday, on October 1st of the year for which they are elected.

2. Candidates must be at least in their Sophomore Year at some recognized degree-granting University or College of Canada, and (if elected) complete the work of that year before coming into residence at Oxford.

3. Candidates may compete either in the Province in which they have acquired any considerable part of their educational qualification, or in the Province in which they have their ordinary private domicile, home or residence.

In each Province there is a Committee of Selection, appointed by the Trustees, in whose hands the nominations will rest. The Secretary of the Committee of Selection for Ontario is D. R. Michener, Esq., Barrister, Continental Life Building, Toronto 2.

The Committees of Selection are instructed to bear in mind the suggestions of Mr. Rhodes, who wished that, in the choice of his Scholars, regard should be had to

(*a*) Force of character, devotion to duty, courage, sympathy, capacity for leadership.

(*b*) Ability and scholastic attainments.

(*c*) Physical vigor, as shown by participation in games or in other ways.

Every candidate for a Scholarship is required to furnish to the Committee of Selection for his Province the following:—

(*a*) A certificate of age.

(*b*) A photograph preferably unmounted and not larger than 4×7 inches.

(*c*) A written statement from the President or Acting President of his College or University to the effect that his application as a suitable candidate is approved.

(*d*) Certified evidence as to the courses of study pursued by the Scholar at his University, and as to his gradings in those courses. This evidence should be signed by the Registrar, or other responsible official, of his University.

(*e*) A brief statement by himself of his athletic and general activities and interests at College, and of his proposed line of study at Oxford.

(*f*) Not more than four testimonials from persons well acquainted with him.

(*g*) References to four other responsible persons, whose addresses must be given in full, and of whom two at least must be professors under whom he has studied.

(*h*) Medical certificate.

It is in the power of the Committee of Selection to summon to a personal interview such of the candidates as they find desirable to see, and, save under exceptional circumstances, no Scholar will be elected without such an interview. Where such an interview is dispensed with, a written statement of the reasons will be submitted to the Trustees.

The next appointments will be made for 1928; applications for these Scholarships with all required material must reach the Secretary of the Committee of Selection not later than October 20th, 1927.

Each Scholarship is of the value of £400 a year, and is tenable for three years, subject to the continued approval of the College at Oxford of which the Scholar is a member.

Rhodes Scholars,, from this Faculty:—

W. J. Browne, B.A.Sc., 1919.
D. W. Dow, 1925.

THE KHAKI UNIVERSITY AND Y.M.C.A. MEMORIAL SCHOLARSHIP FUND

The Khaki University and Y.M.C.A. Memorial Scholarship Fund was established by the Khaki University Committee. At the present time this fund is being used to make loans to returned-soldier students of the higher years. Applications for such loans should be made to the President of the University.

THE JARDINE MEMORIAL PRIZE FOR ENGLISH VERSE

1. This prize, of the value of $100, is the gift of the late Mrs. T. Herbert Barton in memory of her brother Flight-Lieutenant Gordon Jardine, and is open to any regular undergraduate student who has been in actual attendance at the University during the academic year preceding the date of submission (November 1) or who graduated in the previous academic year.
2. The subject and metre of the poem shall be left to the choice of the competitor.
3. The poems shall be in the hands of the Registrar of the University by November 1st.
4. Each poem shall be signed with a pseudonym and the competitor's name shall be submitted to the Registrar in a sealed envelope on which the pseudonym shall be written.
5. With his or her name the competitor shall enclose a signed statement that the poem is absolutely his or her original work.
6. The competition shall be judged by a board of five examiners, consisting of the head of the Department of English in each of the four colleges, and of a fifth examiner to be chosen by these four.
7. The examiners shall have the power to withhold the award in any year if no poem which has been submitted for that year be found worthy of the prize.

THE UBUKATA FUND

The S. Ubukata Fund of $10,000, the gift of Mr. S. Ubukata, provides for the establishment of prizes, medals, scholarships and loans for which Japanese students of all faculties and colleges may be eligible. Information regarding the conditions of award may be obtained from the Registrar of the University.

THE F. W. JARVIS BURSARIES

Two Bursaries, known as "The F. W. Jarvis Bursaries", of the value of $50 each, the gift of A. H. Jarvis, Esq., of Ottawa, brother of F. W. Jarvis, to be awarded under the following conditions:

1. These Bursaries are open only to former students of Ottawa Collegiate Institute (Lisgar Street), who without some such assistance may not be able to carry on their academic courses.
2. They may be awarded at Matriculation or in any year of an undergraduate course in any Faculty of the University.

3. They shall be awarded preferably one to a man and the other to a woman student; but if in any year students of opposite sexes do not apply, both Bursaries may be awarded to men or to women.

4. A Bursary may be held in successive years by the same student and also in conjunction with any scholarship awarded by the University or the federated colleges.

5. The Bursaries shall be awarded by the Senate of the University on the recommendation of a Committee of Award consisting of the President of the University, the Principal of Ottawa Collegiate Institute and the donor; candidates shall make application for the same not later than May 15th on the special form to be obtained from the Registrar.

The University of Toronto War Memorial Scholarships

Four Scholarships, each of the value of two hundred and fifty dollars have been established by the Alumni Federation of the University from the War Memorial Fund to be awarded to students in the Faculties of Applied Science and Engineering and Forestry.

The general basis on which scholarships may be awarded shall be as follows: (*a*) Standing in course of studies. (*b*) Need of assistance. (*c*) Merit as shown in extra-academic activities—executive, literary, dramatic, athletic, etc. (*d*) Relationship, if any, to active service during the War.

Information regarding these scholarships may be obtained from the Secretary-Treasurer of the Alumni Federation, Room 225, Simcoe Hall, to whom applications for the same must be made not later than Feb. 15th.

The McCharles Prize

This prize was established in connection with the bequest of the late Æneas McCharles of Provincial Government bonds of the value of $10,000, and is awarded on the following terms and conditions, namely, that the interest therefrom shall be given from time to time, but not necessarily every year, like the Nobel prizes in a small way: (1) To any Canadian from one end of the country to the other, and whether student or not, who invents or discovers any new and improved process for the treatment of Canadian ores or minerals of any kind, after such process has been proved to be of special merit on a practical scale; (2) Or for any important discovery, invention or device by any Canadian that will lessen the dangers and loss of life in connection with the use of electricity in supplying power and light; (3) Or for any marked public distinction achieved by any Canadian in scientific research in any useful practical line. The following conditions, as passed by the Board of Governors, determine the method of award:—

(1) The title shall be the McCharles Prize.

(2) The value of the prize shall be One Thousand Dollars ($1,000.00) in money.

(3) The term "Canadian" for the purpose of this award shall mean any person Canadian born who has not renounced British alliance; and for the purpose of the award in the first of the three cases provided for by the bequest, domicile in Canada shall be an essential condition.

(4) Every candidate for the prize shall be proposed as such in writing by some duly qualified person. A direct application for a prize shall not be considered.

(5) No prize shall be awarded to any discovery or invention unless the same shall have been proved to the satisfaction of the awarding body, to possess the special practical merit indicated by the terms of the bequest.

(6) The order of priority in which the three cases stand in the wording of the bequest shall be observed in making the award; that is, the award shall go *caeteris paribus* to the inventor of methods of smelting Canadian ores; and, failing such inventions, to the inventor of methods for lessening the dangers attendant upon the use of electricity; and only in the third event, if no inventors of sufficient merit in the field of metallurgy and electricity present themselves, to the inventor distinguished in the general field of useful scientific research.

(7) The first award was made in 1910.

(8) The composition of the awarding body shall be as follows:—
An expert in Mineralogy,
An expert in Electricity,
An expert in Physics,
and four other persons. All of the members of this body shall be nominated by the Board of Governors of the University of Toronto.

THE 1851 EXHIBITION SCIENCE RESEARCH SCHOLARSHIP

The Royal Commissioners for the Exhibition of 1851, if satisfied with the qualifications of the candidates put forward, will each year allot three Science Research Scholarships to Canada. The University of Toronto has been invited to recommend annually one or more candidates in order of merit for these Scholarships.

1. Each candidate recommended must be a British subject and under twenty-six years of age, except under very special circumstances; he must be a bona fide student of Science of not less than three years' standing; he must also have completed a full University course and have spent at least one full academic year at this University prior to the date of recommendation.

2. The record of a candidate's work must indicate high promise of capacity for advancing science or its applications by original research. Evidence of this capacity, which is the main qualification for the Scholarship, is strictly required. The most suitable evidence is a satisfactory account by the candidate of research work already performed, and the

Commissioners will decline to consider the claims of a candidate unless such an account is furnished, or unless there is other equally distinct evidence that he possesses this qualification.

3. Applications for these Scholarships must be made to the Registrar of the University not later than April 15th; the latest date on which the recommendation of the University of Toronto for Scholarships offered in 1928 can be received at the Office of the Commissioners is June 1st, 1928.

4. Each Scholarship is of the value of £250 per annum, payable quarterly in advance; on presenting to the Commissioners a satisfactory final report at the expiration of his Scholarship the scholar will receive a grant of £25. A scholar who is not in a position to travel at his own expense, or for whom it is not possible to obtain free passage, may make application to the Commissioners for aid towards the payment of his fare from his home to his place of study. A Scholar will receive an additional annual allowance, not exceeding £30, towards the cost of University fees, if, in the opinion of the Commissioners, he is in need of such allowance.

5. The Scholarship will be tenable ordinarily for two years, and in cases of exceptional merit for three years. The continuation of a Scholarship for a second year will depend upon the satisfactory nature of the scholar's first year's work. Renewal for a third year will be granted only where it appears that the renewal is likely to result in work of scientific importance.

6. The scholar will be required to devote himself to research in some branch of pure or applied science, the particular nature of the work proposed to be approved by the Commissioners.

7. A scholarship may be held, with the approval of the Commissioners, at any Institution in the United Kingdom or abroad, but a scholar will not be permitted, except under very special circumstances, to conduct his investigations in the country in which he has received his scientific education.

8. Scholars will be required to furnish reports of their work at the end of each year of tenure of their scholarships.

9. Scholars will be required to devote their whole time to the objects of the scholarship, and will be forbidden to hold any position of emolument which carries with it a duty inconsistent with their obligation to the Commissioners. Scholars must in any case obtain the consent of the Commissioners before accepting any additional emoluments.

10. In case of misconduct on the part of a scholar the Commissioners may, at their absolute discretion, deprive him of his scholarship and all emoluments therefrom.

The regulations adopted by the Senate are as follows:—

The departments, students of which shall be eligible to be candidates. are:—1. Bacteriology; 2. Biochemistry; 3. Botany; 4. Chemistry; 5. Engi-

neering (chemical); 6. Engineering (civil); 7. Engineering (electrical); 8. Engineering (mechanical); 9. Engineering (metallurgical); 10. Engineering (mining); 11. Forestry; 12. Geology; 13. Mineralogy; 14. Physics; 15. Physiology; 16. Zoology.

A student shall not be deemed to be ineligible because of his being on the teaching staff of the University, if he has not been in receipt of a salary of more than $800 per annum and has not been on the teaching staff for more than two years from graduation.

A student shall be deemed to be eligible in the year in which he intends to graduate, but if nominated for the Scholarship his nomination shall be subject to his being successful in passing his examination for his degree.

The nomination of the candidate or candidates shall be made by a Board composed of seven members appointed by the Senate, and the Board shall consist of the Chancellor, the President, the Reverend Dr. Bowles, the Honourable Mr. Justice Masten, the Honourable W. E. Raney, Dr. J. A. Worrell and Dr. C. Morse, and the Board shall have power to call to its aid as assessor any member of the teaching staff.

THE NIPISSING MINING COMPANY RESEARCH FELLOWSHIP

The Nipissing Mining Company has endowed a Research Fellowship in the Department of Mining Engineering to be known as The Nipissing Mining Company Research Fellowship, of the annual value of eleven hundred dollars ($1,100.00).

This Fellowship is open to the graduates of any University.

JUNIOR INSTRUCTORSHIPS

Provision is made for the sessional appointment in various departments of graduates as Fellows or Demonstrators, whose duties shall consist of aiding in the work of instruction under the direction of the department concerned.

Applications for appointment should be made in writing to the Secretary of the Faculty not later than September 1st.

RESEARCH ASSISTANTSHIPS

A number of research assistants in the School of Engineering Research are appointed annually on salary, in the various departments, to carry on the work of research under the direction of members of the staff. This work is accepted as partial fulfilment of the requirements for the degrees of M.A.Sc. and M.Arch. These research assistants are usually recent graduates and are chosen from among those who have displayed special capacity for investigational work in their undergraduate courses. Prospective applicants should consult with members of the staff as soon as possible after the annual examinations.

REGULATIONS RESPECTING EXAMINATIONS

Regular Examinations

Promotions from one year to another are made on the results of the term work and the annual examinations. A Student proceeding to a degree must pass all the term work and the examinations in the subjects of his course and at the periods arranged from time to time by the Council.

Candidates who fail to pass in any year will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they fail before presenting themselves a second time for examination. (This repetition includes vacation work.)

A student who in either term of the session fails to perform the work of his course in a manner satisfactory to the professors in charge, will not be allowed to present himself at the final examinations of the year.

In the second, third and fourth years annual examinations will be held at the beginning of the second term on all subjects completed during the first term.

No student will be allowed to write at any examination who has not paid all fees and dues for which he is liable at that time.

The pass marks required on written examinations is 40% and on practical examinations 60%.

Honours will be granted in each department to the students who obtain at least 50 per cent. in each subject, and 75 per cent. of the total number of marks allotted to the department at the annual examinations.

Honour Graduate standing will be granted to those who obtain honours in the final and in one previous year.

Term Examinations

Term examinations may be held in any subject and at any time at the discretion of the instructor or by order of the Council, and the results of such examination may, if the Council so decides, be incorporated with those of the annual examinations in the same subjects.

Supplemental Examinations

A candidate who fails in one or two subjects at the Annual Examinations will be required to take supplemental examinations in such subjects; but no student will be allowed a supplemental examination in the laboratory work of the fourth year, those reported as failing to attain the required standard in this laboratory work not being allowed to present themselves at the final examinations.

The supplemental written examinations will begin on the 21st day of September, 1927. Notice in writing of his intention of taking such examinations (including practical ones) must be received from the candidate by the Secretary of the Faculty, and the fee of $10.00 received by the Bursar, not later than the first of September. Council reserves the right to reject applications of, or impose penalties upon, those failing to comply

with these requirements. Arrangements will be made to conduct supplemental examinations at the Survey Camp for those students in attendance.

In the case where a candidate desires to write upon an annual examination as a supplemental, his application must be received by the Secretary, and his fee by the Bursar, for the January examinations not later than the first of December and for the April examinations not later than the first of March.

Where a candidate fails to pass a supplemental examination it will be counted as one of the two supplemental examinations which may be allowed him after the next annual examination.

No student will be permitted to take the work required for a laboratory supplemental examination at any time other than the regular time of the session.

OFFICE EXPERIENCE

Department of Architecture

Candidates for the degree of Bachelor of Architecture will be required to submit to Council satisfactory evidence of having worked at least eight months in the office of a member of the Ontario Association of Architects before receiving their degrees. Evidence of work in the office of an architect residing outside of the Province may be substituted, providing that he is a member of the local professional organization.

N.B.—This regulation will be effective for and after the session 1928-1929.

FIELD EXPERIENCE

Department of Mining Engineering

The following are the regulations governing field experience certificates:

A candidate for the degree in the Department of Mining Engineering will be required to present satisfactory evidence of having had at least six months' practical experience in work connected with mining, metallurgy or geology, for which he must have received regular wages.

The time may be spent on geological survey, in ore dressing, smelter or lixiviation works, in an assay office in the vicinity of mining or metallurgical works, on any work in or about a mine other than as an office man or clerk, or in prospecting. Not more than three months on geological surveys will be accepted, and prospecting will only count one-half (*i.e.*, four months' prospecting will be counted as two months) and must not be submitted for more than three of the six months.

Certificates must be made out, signed, countersigned and sent during the first term to the Secretary of the Faculty of Applied Science and Engineering, who will retain them.

SHOP WORK

Departments of Mechanical and Electrical Engineering

Students in Mechanical and in Electrical Engineering are not granted their degree until certificates have been submitted to the Council, and accepted as satisfactory, showing not less than 1,600 hours of mechanical experience in production under commercial conditions. Preferably the work undertaken should be in one of the manufacturing industries or trades with which the course is related. Certificates, on the standard form which may be procured from the Secretary, must be presented on or before the 1st of March of any year.

It is not desirable that a student in these courses should enter the engineering industries without having acquired some experience in mechanical production and it is therefore required that he obtain this experience under commercial conditions, so that he can appreciate shop conditions and limitations.

REGULATIONS RESPECTING TERM WORK

Students working in any laboratory must be governed by the regulations relating thereto as made known from time to time.

No laboratory reports or drawings may be removed from the laboratories without permission. The Council reserves the right to dispose of them as may be thought proper.

No drawings or briefs will be accepted which have not been made in the drafting rooms, and during the hours allotted to such work.

FIELD WORK

Field Work in Surveying of the First and Second Years will be taken on the University grounds, during the first term.

No field notes will be accepted which have not been taken in the field and during the hours allotted to such work.

Students taking practical astronomy are required to take observations in the field for time, latitude and azimuth.

DEPARTMENTAL EXCURSIONS TO POINTS OF INTEREST

As a part of Laboratory Instruction excursions to points of technical interest, both in Toronto and elsewhere, are arranged by the staff. These excursions are treated as laboratory periods with the same requirements as to attendance and reports. The total transportation costs in any one year will probably not exceed Ten Dollars.

SUMMER SURVEY SESSION

Students in Departments 1 and 2 will be required to take the Survey Camp between the second and third years, and on failure to do so this work will be taken as a supplemental in the third year. The work will be taken

previous to the opening of the fall term, during the months of August and September at the University Survey Camp, situated on the shore of Gull Lake, and about five miles from the Village of Minden (Lot No. 9 in 13th Concession of the Township of Lutterworth). The camp may be reached by taking the train leaving Lindsay for Haliburton, and getting off at Gelert. Conveyances will be on hand to meet students and take them to the camp. Personal effects must be limited to sixty pounds in weight, which must include two pairs of blankets, or their equivalent; beds and mattresses only will be provided.

A field course in Geology is given to students in Department 2 the last week of the session at the camp.

Students will report at the camp on the dates shown on page 7.

Students of the Fourth Year in Department 1 who are taking the Astronomy Option are required to spend two weeks at the camp, beginning September 8th, after completing their Third Year.

THESIS

In the Fourth Year each student is required to prepare a thesis. The title, form and time for handing in will be determined for each Department as provided in the prescription, 285, page 110. It shall become the property of the University.

The thesis of each student who works upon a research problem in his fourth year must deal with the subject of investigation. In such cases the theses must be handed in not later than one week prior to the close of the annual examinations.

REGULATIONS RESPECTING STUDENTS IN ATTENDANCE

All interference on the part of any student with the personal liberty of another by arresting him, or summoning him to appear before any unauthorized tribunal of students, or otherwise subjecting him to any indignity or personal violence, is forbidden by the Caput.

A student who is under suspension, or who has been expelled from a College or from the University, will not be admitted to the University buildings or grounds.

The name of the University is not to be used in connection with a publication of any kind without the permission of the Caput.

No student will be enrolled in any year, or be allowed to continue in attendance, whose presence is deemed by the Council to be prejudicial to the interests of the University.

Students proceeding regularly to the degree are required to attend the courses of instruction and the examinations in all subjects prescribed for students of their respective standing, and no student will be permitted to remain in the University who persistently neglects academic work.

Unless special permission is granted by the Council, a student who, at the close of two sessions in the University, has failed to secure standing in his year, will not be permitted registration in the Faculty of Applied Science and Engineering.

The constitution of every University society or association of students in the Faculty of Applied Science and Engineering and all amendments to any such constitution must be submitted for approval to the Council of the Faculty. All programmes of such societies or associations must, before publication, receive the sanction of the Council of the Faculty through the Dean. Permission to invite any person not a member of the Staff of the University to preside at or address a meeting of any society or association must be similarly obtained.

The Students' Administrative Council has been entrusted by the Caput with supervision of the conduct of the students, and subject to the approval of the Caput, has power, through the Students' Court or otherwise to deal with violations of the regulations governing conduct.

No initiation ceremony involving physical violence, personal indignity, interference with personal liberty or destruction of property, may be held by the students of any Faculty or College of the University under the penalty of suspension or expulsion.

Students of the Faculty of Applied Science and Engineering, on the premises of Colleges or Faculties other than those in which they are registered, shall be subject to the regulations and penalties imposed by the administrative authorities of the premises concerned.

Any ceremony connected with the reception of the First Year desired by any Faculty or College must be prepared and carried out by a Committee of the Senior Year of the Faculty or College concerned, with the approval of a joint committee of the Caput and the Students' Administrative Council. The holding of such ceremonies except with this approval shall constitute a breach of discipline.

Any student who may be convicted of having taken part in a parade or procession through the city which has not been authorized by the police authorities after application by the Executive of the Students' Administrative Council, will be severely disciplined.

EXEMPTIONS

Applications for exemption from any of the regulations shall be made to the Council in writing and the particulars of the case fully stated.

A student shall submit to Council evidence of illness or other handicap which occurs during the session immediately after its occurrence: no petition for leniency on account of such incidents will be considered if received after the third day following the last day of examinations.

GENERAL INFORMATION FOR STUDENTS

The Council of University College and the governing bodies of the federated universities and colleges, respectively, have disciplinary jurisdiction over and entire responsibility for the conduct of their students in respect of all matters arising or occurring in or upon their respective college buildings and grounds, including residences.

The councils of such of the faculties as have assigned for their separate use any building or buildings and grounds, including residences, have disciplinary jurisdiction over and entire responsibility for the conduct of all students in their respective faculties in respect of all matters arising or occurring in or upon such building, or buildings and grounds.

In all such cases, and, save as aforesaid, as respects all students to whatsoever college or faculty they may belong, disciplinary jurisdiction is vested in the Caput, but the Caput may delegate its authority in any particular case or by any general regulation to the council or other governing body of the university or college or faculty to which the student belongs.

The Caput has also power and authority to determine by general regulations, or otherwise, to what college, faculty or other body the control of university associations belongs.

If there be any questions as to the proper body to exercise jurisdiction in any matter of discipline which may arise, the same shall be determined by the Caput, whose decision shall be final.

Disciplinary jurisdiction includes the power to impose fines.

Information as to the text-books, instruments and materials to be purchased by the students will be given on registration at the beginning of the session.

HART HOUSE

Hart House, the gift of the Massey Foundation, is so called in memory of Mr. Hart Massey. In its widest interpretation it seeks to provide for all the activities in the undergraduate's life apart from the actual work in the lecture room. It affords all the facilities of a first-rate club. In the beauty of its architecture and the various functions which it performs it is unique on this continent.

Hart House contains completely equipped club rooms, including common rooms, reading room, music room, lecture room, sketch room, photographic dark rooms, the Great Hall, which is the students' dining hall, a small Chapel, rooms reserved for religious organizations in the University, gymnasia, squash courts, swimming pool, running track, rifle range, billiard room, library and Hart House Theatre.

Hart House is open from 8.00 a.m. to 11.00 p.m. daily and meals are served in the Great Hall throughout the academic year. Members are entitled to full privileges of all rooms in the building between these hours and the use of the gymnasia, pool, showers and locker rooms until 6.30 p.m. each day, except Sunday, subject to the regulations of the Athletic Association.

The Library contains a good selection of books of general interest. These books must not be taken from the room.

Sunday Evening Concerts are given by the leading musicians of the city at 9 p.m. in the Great Hall on certain Sundays during the session and music recitals take place at 5 p.m. every Friday in the Music Room.

The Sketch Room is equipped with facilities for drawing and painting. Weekly drawing and painting classes are given by a qualified instructor and frequent exhibitions of pictures and lectures on Art are arranged.

A group of rooms is set apart for the use of the Faculty Union. A dining room and a common room are also reserved for Graudate Members. Six bed-rooms are available for the use of guests at a reasonable charge.

The Warden is entrusted with the general supervision of the whole house in co-operation with the following committees: House, Hall, Library, Music, Billiard, Sketch, Camera and Squash. These committees consist of two senior members, a graduate member, the Warden and a full representation of undergraduates. The undergraduates are elected annually by their fellow students. The Board of Stewards is the Senior Committee and has final control of the House, being directly responsible to the Board of Governors. It consists of the Warden (*ex officio* chairman) and representatives of the President of the University, the Board of Governors, the Faculty Union, the Athletic Association, the Graduate Members, the Student Christian Association, the Students' Administrative Council and the undergraduate secretaries of all Standing Committees.

All male undergraduates proceeding to a degree in the University are members of Hart House. The annual fee of $8.00 covers all fees in connection with Hart House and membership in the Athletic Association for the academic year (September to May). Membership Cards may be obtained at the Warden's Office on presentation of the Bursar's receipt for fees paid.

Hart House has no endowment whatsoever and is entirely dependent for its upkeep on the fees received from graduates and undergraduates and from various sources of revenue in the House itself.

Other male students in the University, or students in the affiliated or federated institutions receiving instruction in the University, may become members of Hart House on payment of the required fee at the Warden's office.

Graduates are entitled to the full privileges of Hart House on payment of an annual fee of $10.00. Out-of-town graduates may become members on payment of an annual fee of $2.50.

HART HOUSE THEATRE

Hart House Theatre is a Repertory Theatre existing to promote the interests of dramatic art in the widest sense. Its performances are open to members of the University and to the general public. The Theatre is operated by a Board of Syndics, who are responsible to the Governors of the University for its administration. It is the policy of the Syndics to permit the use of the Theatre by those dramatic societies within the University which are endeavouring to do serious work.

STUDENTS' ADMINISTRATIVE COUNCIL

The Students' Administrative Council has been entrusted by the Caput with supervision of the conduct of the students, and has power subject to the approval of the Caput to deal with violations of the regulations governing conduct.

Any student who may be convicted of having taken part in a parade or procession through the city which has not been authorized by the police authorities after application by the Executive of the Students' Administrative Council, will be severely disciplined.

UNIVERSITY OF TORONTO ATHLETIC ASSOCIATION

University Athletics for men are under the entire control of the University of Toronto Athletic Association, of which the executive body is the Athletic Directorate. This consists of:

The President of the University,
Two members of the faculty, appointed by the President,
Two graduates, appointed by the Athletic Advisory Board,
The Medical Director and the Financial Secretary (*ex officio*),
Five undergraduates, elected annually,
An undergraduate representative, appointed by the Executive of the Students' Administrative Council.

The Directorate alone has the power to sanction the use of the name "The University of Toronto" in connection with men's athletics, and no athletic event can be held in the University without its approval. It has control of the Athletic Field, the Gymnasium, the Swimming Pool, and other conveniences in connection with Athletics in Hart House, and is empowered by the Board of Governors to make the necessary arrangements to effect the carrying out of the University regulations requiring Physical Training for men.

THE GRADUATING DEPARTMENTS

The instruction in the various departments leading through the four years to the degrees of B.A.Sc. and B.Arch. is designed to give the student a thorough grounding in the fundamentals of the engineering and architectural professions, and in addition a sufficient familiarity with applications of the principles to make him immediately useful upon graduation.

With the exception of Architecture and Chemical Engineering the various courses are very similar in the first year. The succeeding years are devoted to the more particular work of the departments. In the fourth year specialization develops to the extent of various options.

The graduating courses are so designed, with many subjects common to the departments of the several years, that the student upon graduation will find himself sufficiently equipped in the various fundamentals to pursue readily his studies in branches other than the one in which he has graduated and indeed to be useful in them as well. The courses in this Faculty are not planned to make specialists; the process of specialization is more properly deferred until after graduation.

In the teaching of the fundamentals, instruction is not confined wholly to applied science. As the future engineer is vitally concerned with the development of the country, it is essential that he be instructed as well in certain fundamentals in economics, administration and business which, in conjunction with his scientific training, will enable him to develop his full value.

In some departments laboratory work in the fourth year consists of an investigation of some specific problem. In all cases the student's knowledge of the original literature and primary sources of information is extended, and he is given a very desirable and useful training in methods of research. In this way the undergraduate course is linked with the graduate course (see p. 111) and with the work of the School of Engineering Research (see p. 110).

On the following pages the courses of instruction in the different departments are set forth in detail. The time devoted to lectures and practical work is indicated as accurately as possible, but is subject to modification from time to time as occasion may require.

For further information concerning the opportunities available for graduates of this Faculty, reference should be made to the pamphlet issued by the Director of Extension Work and Publicity of the University entitled "Opportunities for Graduates in Applied Science."

1. DEPARTMENT OF CIVIL ENGINEERING

The course in Civil Engineering is designed to meet the needs of the students who intend to take up such work as Geodetic Surveying, Railway Engineering, Municipal Engineering, Sanitary Engineering, Highway Engineering, Structural Engineering, Hydraulic Engineering, and administrative work in connection with both Engineering and Industrial undertakings.

FIRST YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Geometrical Optics	185 (*b*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	2

SECOND YEAR

Subject	No.	Hours per week			
		First Team		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	184	...	..	..	..
Calculus	237	1	1	1	1
Spherical Trigonometry	239	1	0	0	0
Elementary Astronomy	71	1	0	1	0
Descriptive Geometry	162	1	0	1	0
Surveying	272, 273	1	9	1	0
Dynamics	3	1	0	1	0

CIVIL ENGINEERING—SECOND YEAR—Cont.

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Mechanics of Materials......	4	2	0	2	0
Engineering Chemistry......	93	1	0	0	0
Inorganic Chemistry	87A	1	0	0	0
Organic Chemistry..........	95	0	0	1	0
Metallurgy.................	241	0	0	1	0
Geology....................	195	0	0	2	0
Mineralogy.................	257,259	2	1	0	2
Hydrostatics...............	186	0	0	1	1
Heat.......................	187	1	1½	0	0
Photography................	188	1	1½	0	1½
Economics & Finance........	123	1	0	1	0
Chemical Laboratory........	89	0	0	0	6
Engineering Drawing........	169	0	4½	0	13½
Physical Training..........	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Survey Camp............	275	...	...	...	...
Engineering Chemistry....	102	1	0	1	0
Theory of Structures......	6	2	0	2	0
Thermodynamics.........	223, 224	1	0	1	2
Hydraulics...............	205, 206	2	0	2	3
Least Squares............	240	0	0	1	0
Practical Astronomy and Geodesy...............	72, 73	2	2	2	0
Descriptive Geometry.....	164	1	0	0	0
Surveying and Levelling...	274	1	0	1	0
Electricity...............	143, 144(*a*)	1	3	1	0
Stress Graphics..........	10	1	0	1	0
Cements and Concrete....	11	0	0	1	0
Engineering Geology......	197	1	0	1	0
Commercial Law.........	124	1	0	1	0
Public Speaking..........	133	1	0	0	0
Mechanics of Materials Laboratory............	9	0	3	0	0
Engineering Drawing......	173	0	15	0	12

CIVIL ENGINEERING—FOURTH YEAR

(a) Astronomy Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Survey Camp..........	275	..	..	..	..
Thesis.................	285	0	3	0	0
Engineering Economics..	125	0	0	1	0
Engineering Law........	126	1	0	0	0
Contracts and Specifications................	127	0	0	1	0
Management...........	128	1	0	0	0
Astronomy.............	74, 76	2	23	2	0
Geodesy...............	75, 76	2	0	2	23
Photographic Surveying.	191 (*b*)	1	2	0	0

FOURTH YEAR

(b) Municipal Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis.................	285	0	3	0	0
Engineering Economics..	125	0	0	1	0
Engineering Law........	126	1	0	0	0
Contracts and Specifications................	127	0	0	1	0
Management...........	128	1	0	0	0
Reinforced Concrete.....	15	1	0	1	0
Foundations............	14	1	0	1	0
Hydraulics.............	211	1	3	0	0
Structural Design.......	17	1	0	0	0
Structural Design Drawing..................	179	0	0	0	5
Miscellaneous Structures	19	0	0	1	0
Hygiene and Bacteriology................	82	1	0	1	6
Biology................	81	0	5	0	0
Sanitary Chemistry.....	117	1	6	0	4
Sanitary Engineering....	280	1	3	1	6
Highway Engineering...	281	1	3	1	3
Municipal Seminar (including Town Planning)................	282	0	3	0	3
Municipal Administration (including Civics)	132	1	0	1	0

CIVIL ENGINEERING—FOURTH YEAR—(c) Structural Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Physical Metallurgy	252	1	0	1	0
Structural Design	17, 18	2	0	1	0
Miscellaneous Structures	19	0	0	1	0
Mechanics of Materials Laboratory	13	0	3	0	6
Structural Design Drawing	178	0	22	0	22

FOURTH YEAR—(d) Hydraulic Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Hydraulics	207, 208, 209	3	10	3	10
Physical Metallurgy	252	1	0	1	0
Structural Design	17, 18	2	0	1	0
Miscellaneous Structures	19	0	0	1	0
Electrical Laboratory	144 (*a*)	0	0	0	3
Mechanics of Materials Laboratory	13	0	6	0	3
Structural Design Drawing	179	0	4	0	8

CIVIL ENGINEERING—FOURTH YEAR

(e) Railway Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Hydraulics	211	1	3	0	0
Special Geology	204	0	0	1	1½*
Physical Metallurgy	252	1	0	1	0
Electrical Laboratory	144 (*a*)	0	0	0	3
Motive Power	225	1	0	1	0
Railway and Miscellaneous Structures	20, 19	1	0	1	0
Railway Economics	131	2	0	2	0
Railway Location and Design	276	1	8	1	8
Mechanics of Materials Laboratory	13	0	3	0	6
Structural Design Drawing	179	0	6	0	6

*The ½ hour represents two excursions during the term.

2. DEPARTMENT OF MINING ENGINEERING

The course in Mining Engineering, which originated in 1878 as a course in Assaying and Mining Geology, is intended to serve as a preliminary training for those who expect to practice in some branch of Mining Engineering, such as exploration of mining areas and primary development, mine surveying, mining processes involving civil, mechanical, and electric work of underground workings, mining machinery and operation; milling and treatment of ores, assaying and other forms of analysis and research, and administrative work in connection with both Engineering and Industrial undertakings.

FIRST YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Mineralogy	255, 258	2	1	0	3
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Mining Laboratory	50	0	0	0	3
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	2

MINING ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	184	..	..	..	..
or Vacation Work	68	..	..	..	..
Descriptive Geometry	162	1	0	1	0
Surveying	272, 273	1	6	1	0
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Inorganic Chemistry	87A	1	0	0	0
Inorganic Chemistry	87B	0	0	1	0
Organic Chemistry	95	0	0	1	0
Metallurgy	241	0	0	1	0
Geology	195	0	0	2	0
Mineralogy	260, 261	1	2	1	2
Mining	51, 53	1	3	0	0
Theory of Measurements	65	1	0	0	0
Steam Engines	216	1	0	0	0
Machine Design	234	1	0	1	3
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89, 90	0	6	0	6
Engineering Drawing	169	0	3	0	12
Physical Training	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	69	..	..	..	..
Survey Camp	275	..	..	..	..
Geological Field Work	193	..	..	..	..
Engineering Chemistry	102	1	0	1	0
Theory of Structures	7	2	0	0	0
Hydraulics	205, 206	2	0	2	3
Analytical Chemistry	88	1	0	1	0
Electricity	143	1	0	1	0
Assaying	45, 46	1	3	0	3
Economic Geology	202, 203	1	0	3	2
Dynamic and Structural Geology	198	1	0	0	0
Ore Dressing	58, 59	1	3	1	3
Physics of Ore Dressing	64	1	0	1	0
Mining	54	1	0	1	0
Petrography	262	1	0	1	0
Metallurgy	243	1	0	1	0

Mining Engineering—Third Year—Cont.

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Physical Metallurgy.......	244	0	0	2	0
Commercial Law..........	124	1	0	1	0
Petrography Laboratory ..	263	0	2	0	2
Introductory Research.....	66	0	0	0	3
Chemical Laboratory	99	0	0	0	9
Hydraulics Laboratory....	210	0	0	0	3
Engineering Drawing......	174	0	9	0	0

Fourth Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work..........	70	..	..	..	..
Thesis..................	67	0	7	0	10
Mine Cost Keeping and Management...........	56	1	0	1	0
Thermodynamics.........	223	1	0	1	0
Assaying.................	47, 48	0	0	1	3
Electrochemistry..........	107, 108	2	3	0	0
Geology, Pleistocene and Physiographic	194, 201	1	1	0	0
Geology, Precambrian.....	199	2	0	0	0
Geology, Mining.........	200	0	0	2	0
Metallurgy...............	247	1	0	1	6
Mining..................	55	1	0	1	0
Ore Dressing.............	60, 61	1	6	1	0
Engineering Economics....	125	0	0	1	0
Metallography............	251	0	0	0	3
Electrical Laboratory.....	144 (*b*)	0	3	0	0
Mechanics of Materials Laboratory............	9	0	0	0	3
Thermodynamics Lab'y...	224	0	3	0	0

3. DEPARTMENT OF MECHANICAL ENGINEERING

The course in Mechanical Engineering is intended to serve as a preliminary training for those who intend to take up work connected with the design, manufacture, installation, or operation of machinery for the use of power as generated by steam, gas, oil, and water, and machinery and methods for the production, transportation, and handling of material, heating, ventilation, refrigeration, compressing of air, pumping of water, and all problems of a mechanical nature, and administrative work in connection with both Engineering and Industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Illuminating Engineering	185 (*a*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	2

MECHANICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	184	0	0	0	0
Calculus	237	1	1	1	1
Descriptive Geometry	162	1	0	1	0
Dynamics	3	1	0	1	0
Mechanics of Materials	4, 9	2	0	2	3
Engineering Chemistry	93	1	0	0	0
Inorganic Chemistry	87A	1	0	0	0
Organic Chemistry	95	0	0	1	0
Metallurgy	241	0	0	1	0
Hydrostatics	186	0	0	1	0
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Steam Engines	216	1	0	1	0
Theory of Mechanism	230	2	1½	2	1½
Compound Stress	10*a*	1	0	0	0
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89	0	0	0	6
Engineering Drawing	170	0	15	0	7½
Physical Training	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Theory of Structures	7	2	0	0	0
Thermodynamics	217, 219	2	3	2	3
Hydraulics	205, 206	2	0	2	3
Heat Engines	218	2	0	2	0
Mechanics of Machinery	231	1	0	1	0
Machine Design	233	2	4	2	10
Magnetism & Electricity	138, 140	1	3	1	4½
Alternating Current	139	1	0	1	0
Physical Metallurgy	244	0	0	2	0
Engineering Drawing	177	0	9	0	0

MECHANICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	1	0	1
Engineering Economics	125	0	0	1	0
Structural Design	17, 18, 180	2	3	0	0
Heat Treatment of Iron and Steel	253	1	0	1	0
Industrial Management	130	1	0	1	0
Reinforced Concrete	15	1	0	0	0
Machine Design	235	2	7	2	7
Thermodynamics	220, 221, 222	3	7	3	8
Hydraulics	207, 208, 209	3	7	3	8

4. DEPARTMENT OF ARCHITECTURE

The instruction in this department is arranged mainly to lay a broad foundation for the subsequent professional life of its graduates The curriculum is based on the belief that an architect should have an education in liberal studies, that he should understand and appreciate the other arts in their relation to architecture, and that his training in design should teach him to regard building construction as an expression of his art rather than as an end in itself With this object in view, the course in Architecture, which was originally derived from the Engineering courses, has been gradually broadened out to include an elementary training in the sister arts of painting and scultpure, and also courses in French and English.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	161	1	0	1	0
Statics	1	2	0	2	0
Building Measurements	37	1	2	1	0
Elements of Architectural Form	28	1	0	1	0
History of Architecture	25	1	3	1	0
Technical English	122(*a*)	1	0	1	0
French	266	2	0	2	0
Modelling	36	0	2	0	2
Freehand Drawing and Water Colour Painting	35	0	3	0	3
Architectural Design / Engineering Drawing	31 / 167	0	14	0	18
Physical Training	269	0	2	0	2

ARCHITECTURE—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work	184	..	..	..	..
Descriptive Geometry	163	1	0	1	0
Mechanics of Materials	5	2	0	2	0
Theory of Architectural Planning	32	1	0	1	0
History of Architecture	25(a)	1	0	1	0
History of Ornament	29	1	0	1	0
Illumination	189	1	1½	1	1½
Economics and Finance	123	1	0	1	0
Technical English	122(b)	1	0	1	0
French	266	2	0	2	0
Modelling	36(a)	0	2	0	2
Freehand Drawing	35(a)	0	3	0	3
Architectural Design Engineering Drawing	31(a) 171	0	17	0	17
Physical Training	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work	41	..	..	..	..
Structural Design	8	2	0	2	0
Acoustics	190	1	1½	1	0
Building Materials	38	2	0	2	0
History of Architecture	25(b)	1	0	1	0
History of Fine Art	30	1	0	1	0
Architectural Composition	33	1	0	1	0
Garden Design	27	0	0	1	0
Commercial Law	124	1	0	1	0
French	266	1	0	1	0
Modelling	36(b)	0	2	0	2
Freehand Drawing and Water Colour Painting	35(b)	0	3	0	3
Architectural Design Engineering Drawing	31(b) 175	0	18	0	18

ARCHITECTURE—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work	42	..	..	..	..
Thesis	286	0	3	0	3
Contracts and Specifications	127	0	0	1	0
Architectural Aspects of of Town Planning	34	0	0	1	0
Advanced Architectural Programmes	26	1	0	1	0
Garden Design	27(*a*)	0	0	1	0
Structural Design	16	1	3	1	3
Heating and Ventilating	40	1	0	1	0
Sanitary Science	39	1	0	1	0
Drawing from Life	35(*c*)	0	3	0	3
Modelling from Life	36(*c*)	0	2	0	2
AND ONE OF:					
Architectural Design	31(*c*)	2	24	2	22
Architectural Engineering	31(*d*), 16	4	22	3	20

6. DEPARTMENT OF CHEMICAL ENGINEERING

The course is designed to give the student a thorough training in Chemistry and its application to industry, as well as a general knowledge of the elements of thermodynamics, hydraulics, machine design, structural design, electricity and metallurgy. A preliminary training of this nature with subsequent practical experience will enable him to undertake the design and construction and also the operation and management of the plant required in such branches of chemical industry as are concerned with the production of chemical and pharmaceutical products, petroleum and its products, rubber goods, leather and glue, soap, meat products, food-stuffs, vegetable and animal oils, sugar, pulp and paper, illuminating gas, coal tar and wood distillates, paints and varnishes, explosives, dyes, glass, portland cement, metals and their alloys, electrochemical products, fermentation products, printers' inks, fertilizers, ceramic and building materials, etc.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Geometrical Optics	185(*b*)	1	2	1	2
Technical English	122(*a*)	1	0	1	0
German	267	2	0	2	0
Business	121	0	0	1	0
Mineralogy Laboratory	256	0	2	0	1
Biological Laboratory	80	0	6	0	0
Chemical Laboratory	86	0	0	0	12
Engineering Drawing	168	0	8	0	0
Physical Training	269	0	2	0	2

CHEMICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	184				
Calculus	237	1	1	1	1
Mechanics of Materials	4	2	0	2	0
Engineering Chemistry	93	1	0	0	0
Organic Chemistry	96	2	0	2	0
Metallurgy	241	0	0	1	0
Hydrostatics	186	0	0	1	1
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Industrial Chemistry	94	1	0	1	0
Physical Chemistry	98	2	0	2	0
Inorganic Chemistry	87A	1	0	0	0
Inorganic Chemistry	87B	0	0	1	0
German	267	1	0	1	0
Economics and Finance	123	1	0	1	0
Chemical Laboratory	92, 97	0	10	0	12
Engineering Drawing	172	0	7	0	3
Physical Training	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Theory of Structures	7	2	0	0	0
Thermodynamics	217, 224	2	0	2	2
Hydraulics	205, 206	2	0	2	1
Metallurgy	243	1	0	1	0
Physical Metallurgy	244	0	0	2	0
Assaying Laboratory	49	0	3	0	0
Analytical Chemistry	88	1	0	1	0
Electrochemistry	107, 108	2	3	0	0
Industrial Chemistry	103	1	0	1	0
Organic Chemistry	105	2	0	2	0
Chemical Plant	104	1	0	1	0
German	267	1	0	1	0
Commercial Law	124	1	0	1	0
Chemical Laboratory	100, 106	0	7	0	17
Engineering Drawing	177	0	6	0	0
Electrical Laboratory	144 (*c*)	0	0	0	3

CHEMICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis....................	285				
Industrial Management....	130	1	0	1	0
Machine Design..........	234	1	0	1	3
German.................	267	1	0	1	0
or Spanish.............	268	1	0	1	0
Inorganic Chemistry......	109	2	0	2	0
Organic Chemistry........	110, 111	1	17	1	0
AND ONE OF:					
Electrochemistry........	114, 115	2	*	2	*
Industrial Chemistry....	112, 113	1	*	1	*
Sanitary and Forensic Chemistry and Bacteriology...........	116	1	*	1	*
Metallurgy.............	247	1	*	1	*
Physical Metallurgy.....	250	1	*	1	*
Ore Dressing..........	62, 63	1	0	1	6
Zymology.............	283	*	*	*	*

*All time not otherwise allotted must be spent in the various laboratories in the proportions assigned by the Department.

7. DEPARTMENT OF ELECTRICAL ENGINEERING

The course in electrical engineering is designed for those who are looking forward to work in connection with the design, manufacture, installation, or operation of electrical machinery and equipment for the generation, transmission, and utilization of power, for domestic and industrial purposes including its many applications to problems of intercommunication in connection with railway, telephone, telegraph, or radio equipment, to work in connection with electrochemical processes, and to administrative work in connection with both engineering and industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Illuminating Engineering	185 (*a*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	2

ELECTRICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	184				
Calculus	237	1	1	1	1
Descriptive Geometry	162	1	0	1	0
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Engineering Chemistry	93	1	0	0	0
Organic Chemistry	95	0	0	1	0
Inorganic Chemistry	87A	1	0	0	0
Hydrostatics	186	0	0	1	1½
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Steam Engines	216	1	0	1	0
Theory of Mechanism	230	2	1½	2	1½
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89	0	6	0	0
Engineering Drawing	170	0	12	0	12
Physical Training	269	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Thermodynamics	217, 219	2	3	2	1
Hydraulics	205, 206	2	0	2	1
Heat Engines	218	1	0	1	0
Mechanics of Machinery	231	1	0	1	0
Machine Design	233	2	4½	2	4½
Alternating Current	139	1	0	2	0
Physical Metallurgy	244	0	0	2	0
Electrochemistry	107, 108	2	3	0	0
Magnetism and Electricity	138	2	0	1	0
Electrical Design	141, 142	1	3	1	3
Commercial Law	124	1	0	1	0
Electrical Laboratory	140	0	6	0	6

ELECTRICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285				
Engineering Economics	125	0	0	1	0
Industrial Management	130	1	0	1	0
Applied Electricity	145, 146	4	20	4	19
AND ONE OF:					
Hydraulics	207, 208, 209	3	9	3	10
Thermodynamics	220, 221, 222	3	9	3	9
Electrochemistry	114, 115	2	9	2	9
Illumination Design	192	2	9	2	9
Radiotelegraphy	147, 148	2	9	2	9
and					
Acoustics	191(*a*)	1	1	0	0

8. DEPARTMENT OF METALLURGICAL ENGINEERING

This course is designed for those who intend to take up work in connection with the production, treatment and working of metals for the purposes of industry; or the design, construction, or operation of metallurgical plants including smelters, furnaces, foundries, refineries, and lixiviation works; and administrative work in connection with both Engineering and Industrial undertakings.

An optional course in this Department is provided in the Third and Fourth years for those students who wish to become Ceramic Engineers. Ceramic plant experience, approved by the Department, will be necessary before the student will be given his degree. Students who have successfully completed their first and second years in any department of engineering will be allowed to transfer to the Department of Metallurgical Engineering for pursuing this option.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Technical English	122(*a*)	1	0	1	0
Business	121	0	0	1	0
Mineralogy Laboratory	256	0	2	0	1
Engineering Drawing	166	0	11	0	18
Physical Training	269	0	2	0	2

Metallurgical Engineering—Second Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Chemistry	87A, 87B, 91	1	14	1	13
Metallurgy	241, 242	1	0	2	0
Geology and Ore Deposits	196	1	1	1	1
Steam Engines	216	1	0	0	0
Electricity	136, 137	2	3	2	3
Spanish	268	1	0	1	0
Economics and Finance	123	1	0	1	0
Engineering Drawing	172	0	3	0	6
Physical Training	269	0	2	0	2

Third Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Cements and Concrete	11	0	0	1	0
Heat Engines	218	1	0	1	0
Electricity	143, 144(*d*)	1	3	1	3
Electrochemistry	107, 108	2	3	0	0
Assaying	45, 46	1	3	0	3
Ore Dressing	58, 59	1	3	1	3
Mining	51, 52	1	0	1	0
Metallurgy	245	2	3	1	6
Physical Metallurgy	246	1	3	1	0
Machine Design	234	1	0	1	3
Commercial Law	124	1	0	1	0
Chemical Laboratory	101	0	0	0	6
Engineering Drawing	182	0	3	0	0
Analytical Chemistry	88	1	0	1	0

METALLURGICAL ENGINEERING—THIRD YEAR

(a) Ceramic Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Physical Chemistry	98	2	0	2	0
Engineering Geology	197	1	0	1	0
Theory of Structures	7	2	0	0	0
Cements and Concrete	11	0	0	1	0
Commercial Law	124	1	0	1	0
Engineering Drawing	177	0	6	0	6
Thermodynamics	223, 224	1	0	1	2
Machine Design	234	1	0	1	0
Mineralogy	255, 258	2	1	0	0
Petrography	260	1	0	1	0
Ceramics (General and Manufacturing)	254(*a*)	4	0	2	0
Glazes	254(*b*)	0	0	2	0
Ceramic Calculations	254(*c*)	0	0	1	0
Ceramic Laboratory	254(*d*)	0	6	0	6
Clay Testing	254(*e*)	0	6	0	6

FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	6	0	6
Engineering Economics	125	0	0	1	0
Contracts and Specifications	127	0	0	1	0
Plant Management	129	0	0	1	0
Thermodynamics	223	1	0	1	0
Assaying	47, 48	0	0	1	3
Ore Dressing	60, 61	1	6	1	0
Electrochemistry	114, 115	2	3	2	3
Metallurgy	249	1	0	1	0
Metallurgy Problems	248	2	4	2	4
Physical Metallurgy	250	1	3	1	3
Thermodynamic Laboratory	224	0	3	0	0
Hydraulic Laboratory	210	0	0	0	3

METALLURGICAL ENGINEERING—FOURTH YEAR

(a) Ceramic Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Contracts and Specifications	127	0	0	1	0
Plant Management	129	0	0	1	0
Reinforced Concrete	15	1	0	1	0
Structural Design	18	1	0	0	0
Silicate Chemistry	116(a)	0	0	2	0
Pleistocene Geology	194, 201	1	3	1	0
Petrography	262, 263	1	2	1	2
Structural Design Drawing	183	0	6	0	6
Refractories and Ceramic bodies	254(f)	2	0	0	0
Glass and enameled iron	254(g)	0	0	2	0
Ceramic products and specifications	254(h)	1	0	0	0
Ceramic Laboratory	254(i)	0	9	0	9
Thesis	285	0	10	0	10

OUTLINE OF LECTURE AND LABORATORY COURSES PROCEEDING TO BACHELOR DEGREES

On the following pages the courses of instruction are set forth in detail. The time devoted to the various subjects, both for lectures and practical work, is indicated as accurately as possible; the hours, however, shown in the prescriptive schedules on pages 42 to 62 will govern.

The curriculum as printed is intended to cover the prescription for the current year only and does not imply the right of a student to have the course unchanged during any subsequent year of his attendance.

The courses are designed to give the student a sound training in the fundamental scientific principles on which the various branches of engineering are based. The instruction is given by means of lectures and practical work in the laboratories, the drafting rooms and the field.

The courses in the first two years are devoted to the theoretical and essential scientific requirements of the engineering profession as a whole, with an introduction in a few cases of the practical application of these to engineering problems.

In the third and fourth years, the subjects of the former years are continued with particular attention paid to their application to modern engineering practice in the problems of design, erection, installation and operation peculiar to the several branches of the profession.

APPLIED MECHANICS

1. *Statics:*—T. R. Loudon.

All Departments, I Year; 2 hours per week, both terms.

This course of lectures deals with forces in a single plane, and concerns chiefly the calculation of tension, compression and shearing stresses in frame structures and solid beams.

2. *Dynamics:*—T. R. Loudon.

Departments 1, 2, 3, 6, 7, 8, I Year; 2 hours per week; both terms.

This course of lectures deals with bodies having motion of translation in one plane; also with relative motion, momentum, work and energy.

Text Book:—Tutorial Dynamics—Briggs and Bryan.

3. *Dynamics of Rotation:*—W. J. Loudon.

Departments 1, 2, 3, 7, 8, II Year; 1 hour per week; both terms.

This course covers angular motion, including moments of inertia, simple harmonic motion, the pendulum, centres of mass, suspension and percussion, the simple theory of the fly-wheel and the governor.

Text Book:—Dynamics of Rotation—Loudon.

4. *Mechanics of Materials:*—P. Gillespie.

Departments 1, 2, 3, 6, 7, 8, II Year; 2 hours per week; both terms.

In this course the strength and elasticity of materials are mathematically treated. The stresses in such elements of structures as the tie rod, the beam, the strut and the member subjected to shear are investigated and the elementary principles of design established. In the lecture and drafting rooms through numerous problems involving the design of simple beams, columns, riveted connections, etc., these principles are exemplified. The work includes also the discussion of eccentric loading, suddenly applied loads and repeated stresses.

Reference Book:—Mechanics of Materials—Merriman.

5. *Mechanics of Materials:*—T. R. Loudon.

Department 4, II Year; 2 hours per week; both terms.

This course deals with the mathematical consideration of stress and elasticity. Among the problems taken up are the consideration of riveted joints, theory of simple and continuous beams, the theory of columns and simple column footings.

Text:—Strength of Materials—Boyd.

6. *Theory of Structures:*—C. R. Young.

Department 1, III Year; 2 hours per week; both terms.

The work of the first term comprises a thorough discussion of combined stresses, columns, restrained, continuous and trussed beams, multiple section and box girders, and plate girders. A number of designs of structures and structural details are worked out in the class and drafting rooms.

The second term is given chiefly to the design of a riveted truss highway span and a riveted truss railway span, the complete designs being made in the lecture and drafting rooms.

Text Books:—Modern Framed Structures, Part III—Johnson, Bryan and Turneaure; Structural Members and Connections—Hool and Kinne; Structural Problems—Young; Carnegie Pocket Companion; Cambria Steel.

7. *Theory of Structures:*—C. R. Young.

Departments 2, 3, 6 and 8(*a*), III Year; 2 hours per week; first term.

The work is practically the same as that for Department I in the first term.

8. *Structural Design:*—T. R. Loudon, W. J. T. Wright.

Department 4, III Year; 2 hours per week; both terms.

During the first term, the economics of the design of floor systems in timber and structural steel are discussed. The design of masonry piers, structural steel and timber columns is also gone into in the first term.

The second term is taken up in the discussion of the design of roof trusses and an introduction to reinforced concrete.

9. *Mechanics of Materials:*—P. Gillespie.

Department 1, III Year; Department 3, II Year; Department 2, IV Year; 3 hours per week; one term.

This laboratory course is intended to give the student an introduction to the experimental study of the strength and elasticity of materials. It is intended that he shall acquire some familiarity with the construction and operation of testing machines and with the properties of ordinary materials of construction.

Reference:—Laboratory Instruction Sheets, Department of Civil Engineering; Municipal and Structural.

10. *Stress Graphics:*—T. R. Loudon.

Department 1, III Year; one hour per week; both terms.

This course of lectures deals mainly with graphic methods of solving stresses in framed structures. The construction of Shearing Force diagrams, Bending Moment diagrams and Influence Lines is also dealt with.

Text Book:—Graphic Analysis—Wolfe.

10(*a*). *Compound Stress:*—T. R. Loudon.

Department 3, II Year; one hour per week, first term.

This course deals mainly with the discussion of methods determining the stress conditions in bodies subjected to compound stress. Both analytical and graphical methods of analysis are discussed.

11. *Cements and Concrete:*—P. Gillespie.

Departments, 1, 8, and 8 (a) III Year; one hour per week; second term.

The manufacture, testing and use of Portland cement and the fundamentals of the theory of reinforced concrete are discussed in this course of lectures.

12. *Theory of Structures:*—C. R. Young.

Departments 1 (c), (d), (e), IV Year; 2 hours per week; both terms.

The work comprised in this course of lectures concerns arches, suspension bridges, cantilever bridges, swing bridges, deflections, and secondary stresses. Problems based on the lectures are worked out in the drafting rooms.

Reference Books:—Modern Framed Structures, Part II—Johnson, Bryan and Turneaure; Theory of Structures—Spofford.

13. *Mechanics of Materials:*—P. Gillespie.

Departments 1 (c), (d) and (e), IV Year; a laboratory course of 3 hours per week one term and 6 hours per week the other term.

This course of experiments is intended to give the student practice in investigating the elastic and physical properties of iron, steel, concrete, timber, etc., and in the use of instruments of precision designed for that purpose.

Reference Book:—Materials of Construction—Johnson.

14. *Foundations, Retaining Walls and Dams:*—P. Gillespie, W. J. Smither.

Department 1 (b), (c), (d) and (e), IV Year; 1 hour per week; both terms.

This course of lectures is devoted to the design of the structures mentioned. Preparatory to the discussion of the practical aspects of the subjects, and in order to gain familiarity with the fundamental principles involved, a part of the first term is given over to the consideration of the theory of compound stress. The most approved forms of construction of retaining walls, footings, abutments, piers and dams are then described, and typical designs are worked out in the class and drafting rooms.

Some attention is also given to the principles of formula charting.

Text Books and Books of Reference:—Retaining Walls for Earth—M. A. Howe; Walls, Bins and Grain Elevators—M. S. Ketchum; A Treatise on Masonry Construction—I. O. Baker; Design and Construction of Dams—E. Wegmann.

15. *Reinforced Concrete:*—P. Gillespie.

Department 1 (b), (c), (d) and (e); and Department 8 (a), IV Year; 1 hour per week; both terms. Department 3, IV Year; 1 hour per week; first term.

The theory of the strength of reinforced concrete elements including the beam, the slab, the T-beam, the column and the footing, is continued in this course.

The analysis of the monolithic arch by the elastic theory is discussed, and the student is required in the drafting room to apply his knowledge to the design of simple structures.

Reference books:—Principles of Reinforced Concrete Construction—Turneaure and Maurer; Reinforced Concrete Construction, Vol. I—Hool.

16. *Structural Design:*—T. R. Loudon.

Department 4, IV Year; 1 hour lecture and 3 hours laboratory per week; both terms.

During this course of lectures, the economics of the design of buildings in reinforced concrete and steel are discussed. This course of lectures is supplemented by the actual designing of buildings in the drafting room.

Text:—Principles of Reinforced Concrete—Turneaure and Maurer.

17. *Structural Design:*—C. R. Young, W. J. Smither.

Department 1_c, 1_d, IV Year; 1 hour per week; both terms.

Department 1_b and 3, IV Year; 1 hour per week; first term.

This course of lectures is devoted to the problems connected with the structural design of buildings of timber, steel and reinforced concrete. The various structural elements such as the floors, columns, footings, walls and wind bracing, are fully discussed, and portions of typical buildings are designed in the class and drafting rooms.

Text Books:—Handbook of Building Construction—Hool and Johnson; Architects' and Builders' Handbook—Kidder—Nolan.

18. *Structural Design:*—C. R. Young, W. J. Smither.

Departments 1_c, 1_d, 3 and 8 (a), IV Year; 1 hour per week; first term.

Consideration is given in this course to the various types of mill buildings, to the conditions governing their choice and to the details of construction in different materials. Designs of portions of mill buildings are worked out in the class and drafting rooms.

Text Books:—Steel Mill Buildings—Ketchum. Mill Buildings—Tyrrell.

19. *Miscellaneous Structures:*—W. J. Smither.

Department 1 (b), (c), (d) and (e), IV Year; 1 hour per week; second term.

In this course of lectures the application of theoretical principles to the design of a variety of structures is made. Among those structures discussed are transmission line towers, elevated tanks and their supporting towers, standpipes, large pressure pipes, sewers, culverts, small highway bridges, sub-surface tanks and tall chimneys. Whenever possible the lecture work is followed up by designs in the drafting room.

20. *Railway Structures:*—C. R. Young.
Department 1_e, IV Year; 1 hour per week; first term.
A course of lectures with exercises covering alternative bridge layouts with comparative estimates of costs, temporary and permanent trestles, tunnels, tunnels vs. bridges, buildings, turntables, snow sheds and shelters.

ARCHITECTURE

25. *History of Architecture:*—H. H. Madill, E. R. Arthur.
Department 4, I Year; 1 hour per week; both terms.
In this course the development of architecture is traced from Prehistoric times to the Early Romanesque.

25*a*. *History of Architecture:*—H. H. Madill, E. R. Arthur.
Department 4, II Year; 1 hour per week; both terms.
In this course the development of architecture is traced from the Romanesque Period to the present time.

25*b*. *History of Architecture:*—H. H. Madill, E. R. Arthur.
Department 4, III Year; 1 hour per week; both terms.
In this course the work of the Renaissance in Italy, France and England is taken in greater detail than was possible in the broad field covered in the previous year.

26. *Advanced Architectural Programmes:*—H. H. Madill, E. R. Arthur.
Department 4, IV Year; 1 hour per week; both terms.
In this course of lectures the principles underlying the planning of such large buildings as Churches, Departmental Stores, Theatres, Schools, Railway Stations, etc., are discussed in detail.

27. *Garden Design:*—H. B. Dunington-Grubb.
Department 4, III Year.
In this course the historical development of Garden Design is traced from earliest times; the study of sites; the influence of topography, orientation, access, etc., on the problems of design; site planning; the location of buildings; the solution of an actual problem on a typical site.

27*a*. *Garden Design:*—H. B. Dunington-Grubb.
Department 4; IV Year.
The work of the previous year is continued and a problem is set in the studio involving principles of both architectural and garden design.

28. *Elements of Architectural Form:*—E. R. Arthur.
Department 4, I Year; 1 hour per week; both terms.
Lectures on the Five Orders of Architecture, their affiliated forms and other elements used in design. This course is preliminary to the lectures given in the II Year on the Theory of Architectural Planning.

29. *Architectural Ornament:*—H. H. Madill.
Department 4, II Year; 1 hour per week; both terms.
In this course the development of Ornament is traced from the beginning through Egyptian, Assyrian, Grecian, Roman, Byzantine, Romanesque, Gothic and Renaissance styles. An attempt is made to analyze ornament of the best periods and to systematize the principles followed in form and colour.

30. *History of Fine Art:*—C. W. Jefferys, F. Coates.
Department 4, III Year; 1 hour per week; both terms.
The course consists of an outline of the history and development of painting and of the minor pictorial arts from the earliest time until the present day; followed by an outline of the history and development of the different eras of sculpture ranging from the primitive to the present day.

31. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, I Year.
This comprises work done in the Studio, including lettering, the drawing and rendering of the Orders and such elementary motives as a door, a window, etc.
This is followed by a drawing in which the Classic orders and ornament taken from a particular building are arranged in the form of a composition, and by an elementary problem in design.

31*a*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, II Year.
This course is given by means of individual instruction in the studio and by criticisms of the solutions of different problems set during the year. It is in this course that the student begins the serious study of design; continued practice in architectural drawing and rendering affords the training necessary to make of the student a proficient draughtsman.

31*b*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, III Year.
This course is given by individual instruction in the studio and by criticisms of solutions of problems set during the year. The greater part of the course is devoted to problems in design and forms a continuation of the course given in the preceding year.

31*c*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, IV Year.
This course is a continuation of the work of the preceding years, being given by individual instruction in the studio and criticisms of the solution of problems set during the year.
During the second term architectural working drawings of a building designed by the student are prepared in the studio.

31*d*. *Architectural Design:*—T. R. Loudon, H. H. Madill, E. R. Arthur.
Department 4, IV Year; Architectural Engineering Option.
In this course the design and preparation of working drawings and structural details of work of a monumental character is carried on in the studio.

32. *Theory of Architectural Planning:*—E. R. Arthur.
Department 4, II Year.
In this course special attention is given to the elements and general principles of architectural planning.

33. *Architectural Composition:*—E. R. Arthur.
Department 4, III Year.
This course consists of a series of lectures on the theory of architectural design, the analysis of composition, proportion, scale, etc.

34. *Architectural Aspects of Town Planning:*—E. R. Arthur.
Department 4, IV Year; 1 hour per week; second term.
In this course of lectures the Historical Development of Town Planning is traced with particular reference to the Axial Planning of the Renaissance, Public Squares, the Grouping of Buildings and the placing of Monuments.

35. *Freehand Drawing and Water Colour Painting:*—C. W. Jefferys.
Department 4, I Year; 3 hours per week; both terms.
Drawing from still life objects. Primary free hand perspective. Primary pencil, charcoal, and pen and ink rendering.

35*a*. Department 4, II Year; 3 hours per week; both terms.
Drawing and monochrome painting from still life.
Drawing from the cast.
Pencil, pen and ink, and monochrome rendering.
Primary water colour.
Drawing from landscape and natural objects.

35*b*. Department 4, III Year; 3 hours per week; both terms.
Drawing from the cast.
Water colour from still life. Water colour rendering.
Drawing from landscape and natural objects.
Students who are sufficiently advanced are admitted to the Fourth Year Life Drawing Class.

35*c*. Department 4, IV Year; 3 hours per week; both terms.
Water colour from still life and from landscape.
Drawing from life.
Water colour rendering.

36. *Modelling:*—Frederick Coates.
Department 4, I Year; 2 hours per week; both terms.
The Orders. Synopsis of styles.

36*a*. Department 4, II Year; 2 hours per week; both terms.
Problems in figures and in relation to architecture.

36*b*. Department 4, III Year; 2 hours per week; both terms.
Styles continued.
Problems, combination of figure, ornament and architecture and their relative values.

36*c*. Department 4, IV Year; 2 hours per week; both terms.
Modelling from life.
Anatomy.
Composition of groups.

37. *Building Measurement:*—C. H. C. Wright.
Department 4, 1 Year; 1 hour per week; both terms.
In this course of lectures the principles of measurements and mensuration with special reference to buildings will be discussed. With this is combined practice in measurements of existing buildings, quantities, etc.

38. *Building Materials:*—C. H. C. Wright.
Department 4, III Year; 2 hours per week; both terms.
The structural and aesthetic value of the various building materials.

39. *Sanitary Science:*—H. H. Madill.
Department 4, IV Year; 1 hour per week; both terms.
Modern plumbing, its design and installation, drainage, sewerage disposal and water supply.

40. *Heating and Ventilating:*—C. H. C. Wright.
Department 4, IV Year; 1 hour per week; both terms.
The design of different systems, where they should be used, heating specifications, etc.

41. *Vacation Work:*—C. H. C. Wright, H. H. Madill, E. R. Arthur.
Department 4, III Year.
Each student is required to submit a set of rendered measured drawings of existing buildings or portions of buildings, the building first to be approved by the head of the Department, who will also decide the number and size of the drawings to be made. The record of measurements must be preserved in a notebook which will be submitted with the final drawings.

42. *Vacation Work:*—C. H. C. Wright, C. W. Jefferys.

Department 4, IV Year.

Each student is required to submit a set of at least six outdoor sketches in water colour, pen and ink, or pencil. The minimum size for each sheet will be 9″×12″. Of these sketches at least two will be in water colour and three will be of an architectural character.

ASSAYING, MINING AND ORE DRESSING

The work in Mining is directed more to the development of the proper attitude of mind towards mining problems than to the teaching of actual mining methods.

The teaching of Assaying has a two-fold function. The first is to give the student a working knowledge of the practice of the art, so that he can earn money as an assayer on graduation and use this as a stepping-stone to other positions. The second is to use the assaying laboratories for the training of the students in certain important phases of Engineering methods. The size of the apparatus, the completeness of the processes in short intervals of time, the extreme accuracy of results when so desired, the relation of the extent of error to time and method, the similarity of the academic laboratory to the field laboratory, all these permit an unrivalled opportunity for driving home much broad Engineering philosophy. The assaying processes and apparatus lend themselves peculiarly well for the development of a proper perspective in regard to errors and accuracy in measurements.

The study of Ore Dressing, when accompanied by laboratory work in a well equipped ore dressing laboratory, is one of the most important of the Mining Engineering subjects. Not only is the mechanical treatment of ores a very important branch of Mining Engineering, but the mental processes involved in a study of the fundamental principles underlying the art and the compromise necessary for field practice form one of the best fields for the development of Engineering philosophy. From these points of view the ore dressing laboratory is exceptionally well equipped.

45. *Assaying:*—J. T. King.

Departments 2 and 8, III Year; 1 hour per week; first term.

A first course of lectures on the theory of fire assaying. Emphasis is laid not only on the chemical and metallurgical principles involved, but upon the errors inherent in operators as well as in methods.

Text Book:—Manual of Fire Assaying—Fulton.

46. *Assaying:*—J. T. King.
Departments 2 and 8, III Year; 3 hours per week; both terms.
A laboratory course in the determination of the precious metals in ores, milling and metallurgical products. Scorification and crucible assays of ores and products, pure and impure, fluxes, slags and solutions. Buckboard practice, ores with metallics. Copper and lead by electrolysis. Students are expected to do their later assays with despatch and a reasonable degree of accuracy. Neatness of work is required.

47. *Assaying:*—J. T. King.
Departments 2 and 8, IV Year; 1 hour lecture per week; second term.
A continuation of course 45. Complex ores. Combination assays. The sampling and assay of bullion. The Platinum group metals. Checks and corrections.

48. *Assaying:*—J. T. King.
Departments 2 and 8, IV Year; 3 hours per week; second term.
An advanced laboratory course in which some of the methods of course 47 are used.

49. *Assaying:*—J. T. King.
Department 6, III Year; 3 hours per week; first term.
An introductory laboratory course for Chemical Engineers. Some lecture instruction is given. An abbreviation of courses 45 and 46.

50. *Mining:*—H. E. T. Haultain and F. C. Dyer.
Department 2, I Year; 3 hours per week; second term.
A laboratory course, including some lectures, being an introduction to certain mining and milling machinery and methods.

51. *Mining:*—H. E. T. Haultain.
Department 2, II Year and Department 8, III Year; 1 hour per week; first term.
An introductory course of lectures.

52. *Mining:*—H. E. T. Haultain.
Department 8, III Year; 1 hour per week; second term.
An extension of No. 51.

53. *Mining:*—F. C. Dyer.
Department 2, II Year; 3 hours per week; first term.
Continuation of No. 50. Rock drills, sampling methods, use of explosives.

54. *Mining:*—H. E. T. Haultain and F. C. Dyer.
Department 2, III Year; 1 hour per week; both terms.
Principles of mining.

55. *Mining:*—H. E. T. Haultain.
Department 2, IV Year; 1 hour per week; both terms.
Special problems, estimates, reports.

56. *Mine Cost Keeping and Management:*—H. E. T. Haultain.
Department 2, IV Year; 1 hour per week; both terms.
One of the fundamental features that must not be lost sight of by the Mining Engineer is, that his work is designed primarily for purposes of financial profit. This course of lectures deals with details from this point of view. The total cost of a ton of ore requiring as it does an understanding of the problems of amortization, is first dealt with in a broad way. Then are considered various problems of cost keeping, leading on to problems of time and motion study which are essential to the development of the fine points of the art in any particular mining problem. The latter part of the course deals with problems of management, the relations of members of the staff to each other, and the relations of the staff to labour.

58. *Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Departments 2 and 8, III Year; 1 hour per week; both terms.
The general principles of Ore dressing.

59. *Ore Dressing:*—F. C. Dyer.
Departments 2 and 8, III Year; 3 hours per week; both terms.
Work with crushing machinery, principles of crushing and grading, screen analyses, concentration with gravity separation apparatus, etc.

60. *Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Departments 2 and 8, IV Year; 1 hour per week; both terms.
No. 58 continued, study of flow sheets and special problems.

61. *Ore Dressing:*—F. C. Dyer.
Departments 2 and 8, IV Year; 6 continuous hours per week; first term.
Advanced work with ore dressing appliances, ore testing and check mill runs.

62. *Ore Dressing:*—F. C. Dyer.
Department 6*k*, IV Year; 1 hour per week; both terms.
General principles of ore dressing.

63. *Ore Dressing:*—F. C. Dyer.
Department 6*k*, IV Year; 1 period of 6 hours per week; second term.
Principles of sampling, crushing and grading, screen analyses, concentration with gravity separation apparatus, flotation, ore testing, etc.

64. *Physics of Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Department 2, III Year; 1 hour per week; both terms.
Ore dressing methods involve a study of the laws governing the phenomena of surface tension, capillarity and colloidal solutions, in addition to those of hydrostatics and certain phases of hydraulics. This is embodied in a special course of lectures in conjunction with laboratory work in the Ore dressing laboratory.

65. *Theory of Measurement:*—H. E. T. Haultain.

Department 2, II Year; 1 hour per week; first term.

This title is not an entirely suitable one for this course of lectures because it is generally applied to a study of the philosophy of extremely accurate measurements. The Mining Engineer has to continually make satisfactory use of measurements with a wide range of inaccuracy. This course of lectures deals with the philosophy underlying the causes of these errors and the practical application of such approximations. The opportunity is taken in these lectures to deal with the subject of illustrating measurements by graphs.

66. *Introductory Research:*—H. E. T. Haultain and F. C. Dyer.

Department 2, III Year; 3 hours per week; second term.

This is a laboratory course including some lectures and is a preparation for the thesis of the fourth year.

67. *Thesis.*

Department 2, IV Year; 7 hours per week; first term; 10 hours per week, second term, in continuous periods.

Thesis in this department consists mainly in reports on original work done in the laboratories. In the III year the subject "Introductory Research" paves the way for the thesis. During the month of October the student decides on the subject of his thesis in consultation with his professors. After this is decided the student uses his own initiative in the development of his work.

The thesis is divided into three parts. The first part, which is handed in during the first week in November, contains the title, a statement of what the title is meant to convey and an outline of the work that is proposed to be done. The second part is handed in during the first week of January and contains a report of progress to date and enables the professor in charge to keep in closer touch with the work. The third and final part is handed in a week before the examinations and is a report of progress to date with final conclusions. The three parts combined constitute the thesis.

68. *Vacation Work:*—W. A. Parks.

Department 2, II Year.

From students in Department 2, who have been actually engaged during the summer with Government or other approved geological survey parties, geological field notes will be accepted in lieu of construction notes.

69. *Vacation Work:*—H. E. T. Haultain.

Department 2 III Year. (See page 78).

This is a series of letters written during the summer vacation, dealing with various aspects of a mining engineer's work. These are intended to direct and help the student's powers of observation, analysis and criticism as well as being exercises in the art of lucid technical expression.

Four letters are to be written and mailed to the Professor of Mining Engineering, one each month, June, July, August, and September; at least one letter must deal with a labour episode.

70. *Vacation Work:*—H. E. T. Haultain.

Department 2, IV Year.

The student may select either one of the following alternatives:

A. Four letters to be written and mailed, one each month, June, July, August, and September; at least one letter to be on a labour episode: or

B. One letter describing a labour episode to be written and mailed to the Professor of Mining Engineering not later than June 30th, and an article of suitable character and length for submitting to the Engineering Institute of Canada or the Canadian Mining Institute as a student's paper, to be written and mailed to the Professor of Mining Engineering not later than September 30th.

ASTRONOMY AND GEODESY

71. *Astronomy, Elementary:*—R. K. Young.

Department 1, II Year; 1 hour per week, both terms.

A course in descriptive Astronomy, explaining the ordinary astronomical terms, and describing the various celestial bodies and their motions. In the evenings opportunity will be given for identifying the stars and for observing with telescopes.

Text book:—Fath, Elements of Astronomy.

72. *Astronomy and Geodesy:*—L. B. Stewart.

Department 1, III Year; 2 hours per week; both terms.

The course of lectures deals with the determination of time, latitude, longitude and azimuth, by methods adapted to the use of the surveyor's transit and the sextant. It is designed to fulfil the requirements of the final examinations for Ontario and Dominion Land Surveyors.

In Geodesy an account is given of the principles and methods of a secondary triangulation survey, also of the principles involved in the North-West system of survey.

Text books:—Practical Astronomy as applied to Geodesy and Navigation—Doolittle, Notes on Practical Astronomy and Geodesy, Nautical Almanac, 1928.

73. *Field Work:*—L. B. Stewart, S. R. Crerar.

Department 1, III Year; about 2 hours per week, first term.

The practical work in this subject comprises observations in the field with the transit and sextant for the determination of time, latitude and azimuth by the methods described in the lectures.

74. *Astronomy (Advanced):*—L. B. Stewart.

Department 1a, IV Year; 2 hours per week; both terms.

The lecture course in this subject comprises the theory and adjustment of the instruments used in connection with a geodetic survey; the methods of taking and reducing observations for time, longitude, latitude, and azimuth, with the precision required on such a survey; and other matters relating to these subjects.

75. *Geodesy and Metrology:*—L. B. Stewart.

Department 1a, IV Year; 2 hours per week; both terms.

The lecture course includes a description of the methods of measuring base lines and the angles of a triangulation; the geometry of the spheroid with applications to geodetic problems; the computation of geodetic positions; the solution of large triangles on the earth's surface, and the adjustment of a triangulation; trigonometric and precise spirit levelling; the determination of the figure of the earth by arc measurements, and by the pendulum; the theory of map projections, etc.

76. *Astronomy, Geodesy and Metrology:*—L. B. Stewart.

Department 1a, IV Year; about 23 hours per week; both terms.

The practical work in the above subjects includes the observation of meridian transits for time and longitude determinations, and of prime vertical transits for latitude, with the astronomical transit instrument; the observation of meridian zenith distances of stars, and of azimuths at elongation for latitude, with the alt-azimuth; theodolite observations for azimuth; observations for latitude with the zenith telescope; the investigation of the constants of the instruments used, and the reduction of all observations; the measurement of a base line with the steel tape and with invar wires, and the determination of the constants of the tape; the measurement of the angles of a triangulation and the adjustment of the angles of network of triangles, etc. A portion of this work will be taken at the Summer Survey Camp. (See page 35.)

BIOLOGY

80. *Elementary Biology;*—G. H. Duff.

Department 6, I Year; 6 hours per week, first term.

An elementary laboratory course on the nature and identification of plant and animal tissues and products, with microscope practice.

81. *Elementary Biology:*—J. W. MacArthur.
Department 1_b, IV Year.
A special Course of Laboratory work and demonstrations in General Biology, five hours per week, first term.

82. *Hygiene and Bacteriology:*—D. T. Fraser and R. R. McClenahan.
Department 1_b, IV Year.
(1) This is a course of twenty-five lectures, dealing with the principles of Hygiene and Sanitary Science and including a discussion of the facts in Bacteriology which are necessary for a proper understanding of Hygiene and Sanitary Science. The particular phases of the subject which are of importance from the standpoint of Sanitary Engineering are dealt with.
(2) This is a laboratory course of six hours per week, second term, dealing especially with the Bacteriology of water, milk and sewage.

CHEMISTRY

85. *General Chemistry:*—E. G. R. Ardagh.
Departments 1, 2, 3, 6, 7, 8, I Year; 2 hours per week, first term; 1 hour per week, second term.
A lecture course in general chemistry, with experimental illustrations.

86. *Inorganic Chemistry:*—L. J. Rogers.
Department 6, I Year; 12 hours per week, second term.
A laboratory course of quantitative experiments illustrating the use of the sensitive balance, and confirming the fundamental laws of chemistry; qualitative inorganic analysis; quantitative analysis of pure salts.
Text books:—Analytical Chemistry, Vol. II—Treadwell-Hall; Qualitative Chemical Analysis—A. A. Noyes.

87A. *Inorganic Chemistry A:*—E. G. R. Ardagh.
Departments 1, 2, 3, 6, 7 and 8, II Year; 1 hour per week, first term.
A continuation of Course 85 dealing especially with the metals.

87B. *Inorganic Chemistry B:*—E. G. R. Ardagh.
Departments 2, 6 and 8, II Year; 1 hour per week, second term.
A lecture course on theoretical chemistry with special reference to the metals; a continuation of Course 85.
Text book:— Smith's College Chemistry—Kendall.

88. *Analytical Chemistry:*—L. J. Rogers.
Departments 2, 6 and 8, III Year; 1 hour per week, both terms.
A lecture course on the principles of chemical analysis; select gravimetric and volumetric methods; technical analysis.

89. *Analytical Chemistry;*—E. A. Smith.
Departments 1, 2 and 3, II Year; 6 hours per week, second term; Dept. 7, II Year; 6 hours per week, first term.
Laboratory course in qualitative and quantitative analysis.

90. *Analytical Chemistry:*—J. W. Bain.
Department 2, II Year; 6 hours per week, one term.
A laboratory course in the gravimetric determination of metals and acids, with elementary volumetric analysis.

91. *Analytical Chemistry:*—L. J. Rogers.
Department 8, II Year; about 14 hours per week, first term; about 13 hours per week, second term.
A laboratory course comprising gravimetric and volumetric methods, acidimetry and alkalimetry.
Text books:—Analytical Chemistry, Vol. II—Treadwell-Hall; Qualitative Chemical Analysis—A. A. Noyes.

92. *Analytical Chemistry:*—L. J. Rogers.
Department 6, II Year; 180 hours.
A laboratory course in quantitative chemical analysis; inorganic preparations.
Text book:—Analytical Chemistry, Vol. II—Treadwell-Hall.

93. *Engineering Chemistry:*—J. W. Bain.
Departments 1, 3, 6 and 7, II Year; 1 hour per week, first term.
A lecture course consisting of a study of the industrial production and application of heat, and of the chemistry of fuel and the products of combustion.

94. *Industrial Chemistry:*—J. W. Bain.
Department 6, II Year; 1 hour per week, both terms.
A lecture course on the manufacture of salts, acids, alkalies and inorganic chemicals.

95. *Organic Chemistry:*—M. C. Boswell.
Departments 1, 2, 3 and 7, II Year; 1 hour per week, second term.
A lecture course in elementary organic chemistry.

96. *Organic Chemistry:*—M. C. Boswell.
Department 6, II Year; 2 hours per week, both terms.
A lecture course dealing with the aliphatic compounds.

97. *Organic Chemistry:*—M. C. Boswell.
Department 6, II Year; 60 hours, second term.
A laboratory course in organic preparations.

98. *Physical Chemistry:*—F. B. Kenrick.
Departments 6, II Year and Department 8 (a), III Year; 2 hours per week, both terms.
A course of lectures on the elements of chemical mechanics, and the theory of solutions.

99. *Analytical Chemistry:*—L. J. Rogers.
Department 2, III Year; 9 hours per week, second term.
A laboratory course on the technical analysis of ores and furnace products.

100. *Industrial Chemistry:*—E. G. R. Ardagh.
Department 6, III Year; about 7 hours per week, first term, 13 hours per week, second term.
A laboratory course in industrial chemistry

101. *Analytical Chemistry and Phase Rule:*—L. J. Rogers, J. T. Burt-Gerrans.
Department 8, III Year; about 6 hours per week, second term.
A laboratory course in analysis and phase rule.

102. *Engineering Chemistry:*—J. W. Bain, E. G. R. Ardagh.
Departments 1, 2, 3, 6, 7, 8 and 8 (a), III Year; 1 hour per week, both terms.
A lecture course on the application of chemistry to engineering problems; air, water, the materials of construction, explosives, etc.

103. *Industrial Chemistry:*—E. G. R. Ardagh.
Department 6, III Year; 1 hour per week, both terms.
A lecture course on petroleum and its products, coal tar and its products; fats, oils, soap, sugar, starch, gums, rubber; fermentation industries, etc.

104. *Chemical Plant:*—J. W. Bain.
Department 6, III Year; 1 hour per week, both terms.
A lecture course on the machinery and plant used in chemical manufacturing.

105. *Organic Chemistry:*—M. C. Boswell.
Department 6, III Year; 2 hours per week, both terms.
A lecture course on the aromatic series.

106. *Organic Chemistry:*—M. C. Boswell.
Department 6, III Year; 85 hours.
A laboratory course in organic preparations in the aromatic series.

107. *Electrochemistry:*—W. L. Miller.
Departments 6, 7 and 8, III Year; Department 2, IV Year; 2 hours per week, first term.
A lecture course on elementary electrochemistry, illustrated by experiments.

108. *Electrochemistry:*—W. L. Miller and J. T. Burt-Gerrans.
Departments 6, 7 and 8, III Year; 3 hours per week, first term.
Department 2, IV Year.
A laboratory course in quantitative measurements to accompany Course 107.

109. *Inorganic Chemistry:*—J. W. Bain.
Department 6, IV Year; 2 hours per week, both terms.
A lecture course on chemical theory.

110. *Organic Chemistry:*—M. C. Boswell.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on advanced organic chemistry.

111. *Organic Chemistry:*—M. C. Boswell.
Department 6, IV Year.
A laboratory course in advanced organic chemistry; about seventeen hours first term.

112. *Industrial Chemistry:*—J. W. Bain.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on selected subjects in chemical technology.

113. *Industrial Chemistry:*—J. W. Bain, E. G. R. Ardagh, M. C. Boswell.
Department 6, IV Year.
A laboratory course in industrial problems.

114. *Electrochemistry:*—J. T. Burt-Gerrans.
Department 6h, 7h, and 8, IV Year; 2 hours per week, both terms.
An advanced lecture course on the theory of solutions and electrolysis, and the application to the practice of electro-deposition and electrolytic refining of metals. The course also includes lectures on the electric furnace with special consideration of efficiency.
Reference books:—Electrometallurgy—Borchers; Electrochemistry—Le Blanc; Electrochemistry—Luepke; Principles of Applied Electrochemistry—Allmand and Ellingham; The Electric Furnace—Stanfield; The Electric Furnace—Pring.

115. *Electrochemistry:*—W. L. Miller and J. T. Burt-Gerrans.
Departments 6h, 7h and 8, IV Year.
A laboratory course accompanying Course 114.

116. *Sanitary and Forensic Chemistry:*—J. W. Bain.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on the composition and examination of air, water and food; poisons and their detection, with accompanying laboratory course.

116. (*a*) *Silicate Chemistry:*—J. B. Ferguson.
Department 8 (a), IV Year; 2 hours per week, second term. The application of phase rule to the chemistry of refractory materials.

117. *Sanitary Chemistry:*—E. G. R. Ardagh.
Department 1_b, IV Year; 1 hour lecture and 6 hours laboratory, first term; four hours laboratory, second term.
A lecture and laboratory course on water supply, sewage disposal, ventilation, etc.

ECONOMICS AND BUSINESS ADMINISTRATION

121. *Business:*—W. S. Ferguson.
Departments 1, 2, 3, 6, 7, 8, I Year; 1 hour per week, second term.
A lecture course on the principles underlying accounting and general business methods of a simple nature in order to enable the student to understand simple financial reports.

122. *Technical English:*—J. Murray Robertson.
(*a*) All Departments, I Year; 1 hour per week, both terms.
A lecture course on the expression of ideas and the compilation and writing of different types of engineering reports; technical exposition; the derivation and use of technical terms; the necessity of accurate expression in professional writing; terminology; the use of graphic methods for presenting facts; abbreviations; numbers; symbols.
(*b*) Department 4, II Year; 1 hour per week, both terms.
This course of lectures includes a discourse on the literature which refers either directly or indirectly to architecture and the arts. Books are reviewed and discussed in round-table talks and essays prepared for practice in expression. The preparation of specifications and contracts for the execution of construction is continued from the course in the first year, specializing in architectural types.

123. *Economics and Finance:*—C. R. Fay.
All Departments, II Year; 1 hour per week, both terms.
An introduction to the study of Economics. The course will deal in an elementary fashion with the following:
(1) Scope and Method of Economics.
(2) Theory of Value and Distribution.
(3) Structure of Industry and Social Conditions.
(4) Money, Banking and Public Finance.
Text Book:—Economics for the General Reader—Clay.

124. *Commercial Law:*—A. R. Clute.
Departments 1, 2, 4, 6, 7, 8, III Year; 1 hour per week, both terms.
General Principles of the Law of Contracts, Principal and Agent, Partnership and Limited Companies (with special reference to the Companies Acts). General view of the following:—Negotiable Instruments, Sale of Goods, Bills of Sale and Chattel Mortgages, Suretyship and Guarantee.
Text-Book:—Stephens' Elements of Mercantile Law (6th Edition.)

125. *Engineering Economics:*—C. R. Young.
Departments 1, 2, 3, 7, 8, IV Year; 1 hour per week, second term.
A series of lectures on the principles by which the economic practicability of a project is judged and the comparison of competing proposals is made. Consideration is given to first cost and

annual cost, methods of estimating, fixed charges and operating expenses, valuation and appraisals. Special attention is given to depreciation and the methods of providing for it, as well as to its relation to amortization. Typical numerical problems are discussed and solved.

Text Books:—Engineering Economies—Fish; Financial Engineering —Goldman.

126. *Engineering Law:*—R. E. Laidlaw.

Department 1, IV Year; 1 hour per week, first term.

A course of lectures, co-ordinating Engineering practice and Law as contained in various legislation such as: The Railway Act, Municipal Act, Public Health Act, Arbitration Act, Workmen's Compensation Act, Patents, Copyrights, etc.

127. *Contracts and Specifications:*—C. R. Young.

Departments 1, 4, 8, and 8 (a) IV Year; 1 hour per week, second term.

This course of lectures deals with the fundamental principles of contract and specification writing. The critical examination of typical specifications and agreements by the class, forms an essential feature of the instruction.

Text Book: Elements of Specification Writing—Kirby.

128. *Management:*—C. R. Young.

Department 1, IV Year; 1 hour per week, first term.

A series of lectures dealing with the fundamental principles upon which management is based. The possibilities of effective management are indicated and its basis is shown to exist in suitable organization, adequate equipment and smooth administration. Consideration is given to such matters as selection of personnel, essentials of effective organization for enterprises of widely different character and the art of directing a force so as to attain a desired end in an expeditious and effective manner.

Text Books:—Construction Cost Keeping and Management—Gillette and Dana; Principles of Industrial Organization—Kimball; Administration of Industrial Enterprises—Jones.

129. *Plant Management:*—G. A. Guess.

Department 8 and 8 (a), IV Year; 1 hour per week, second term.

A course of twelve lectures dealing with some phases of labour, plant organization, smelter contracts and markets.

130. *Industrial Management:*—E. A. Allcut.

Departments 3, 6 and 7, IV Year; 1 lecture per week, both terms.

This course includes a study of industrial organization, location, arrangement, construction and equipment of industrial plants for efficiency and economy, process routing, scheduling work,

reports, methods of superintending, employment, systems of compensating labour and systems of distributing indirect expenses.

131. *Railway Economics:*—W. M. Treadgold.

Department 1, (e), IV Year; 2 hours per week, both terms.

The object of this course is to make the student acquainted with the general principle of railroad engineering and the following branches of the subject will be discussed—economic theory of location, train resistance, effect of grade, distance and curvature, rise and fall, maintenance of way, yards and terminals, tunnels and street railway practice.

132. *Municipal Administration:*—P. Gillespie, A. T. Laing.

Department 1 (b), IV Year; 1 hour per week, both terms.

A course of lectures dealing with civics, local improvement laws and assessments, building codes, fire control, transportation, public utilities, etc.

133. *Public Speaking:*—W. H. Greaves.

Department 1, III Year; 1 hour per week, first term.

A course on the principles of public speaking and the means of expression accompanied by practical application and training in actual speaking.

ELECTRICITY

135. *Electricity:*—H. W. Price.

Departments 1, 2, 3, 6, 7 and 8, I Year; 2 hours per week, both terms.

A course of lectures on basic principles relating to electric circuits, magnetic circuits, instruments and apparatus in general, distribution of electrical energy, etc., illustrated largely from commercial apparatus. The point of view of this work is quantitative rather than descriptive, for it is believed that men who can solve engineering problems are most likely to grasp underlying principles.

136. *Electricity:*—W. S. Guest.

Departments 3, 6, 7 and 8, II Year; 2 hours per week, both terms.

Deals with the theory of electrical measurements, and detailed study of various methods applicable under different conditions in engineering practice to the measurement of resistance, current, potential difference, power and energy; calibration of commercial measuring instruments. The effect of choice of conditions of measurement on the accuracy of the result is considered.

137. *Electrical Laboratory:*—W. S. Guest.

Departments 3, 6, 7 and 8, II Year; 3 hours per week, both terms.

This laboratory course is closely associated with the lecture course 136 on electricity for the second year. The more important and useful methods of testing generators and circuits for electromotive force, resistance, current, grounds, etc., are practised, often under conditions such as occur in practice. The work also includes methods of calibration of measuring instruments for voltage, current, power and energy, and certain studies of properties of incandescent lamps.

138. *Magnetism and Electricity:*—A. R. Zimmer.

Department 3, III Year; 1 hour per week, both terms.

Department 7, III Year; 2 hours per week, first term; 1 hour per week, second term.

A course of lectures on theory of magnetism and magnetic circuits, theory of direct-current generators, motors, etc.

139. *Alternating Current:*—A. R. Zimmer.

Department 3, III Year; 1 hour per week, both terms.

Department 7, III Year; 1 hour per week, first term; 2 hours per week, second term.

A first course of lectures on alternating current, covering principles of measurement and leading to the analytical and graphical treatment of the simpler problems relative to alternating-current circuits and machinery.

140. *Electrical Laboratory:*—A. R. Zimmer.

Department 3, III Year; 3 hours per week first term, 4½ hours per week second term; Department 7, III Year; 6 hours per week, both terms.

This laboratory course is intended to afford the student an opportunity to become familiar with principles involved in continuous-current shunt, series and compound-wound generators and motors, and, to some extent, alternating-current circuits and machinery. Other sections of the work deal with the magnetic properties of iron and steel, and study of iron losses in transformers and generators.

The course is arranged to stand in close relation to the lecture courses in the subjects of magnetism and electricity and alternating current (138, 139) for III Year, and to certain design work (141).

141. *Electrical Design:*—H. W. Price.

Department 7, III Year; 1 hour per week, both terms.

A course of lectures dealing with design of electrical apparatus and machinery, accompanied by designs to be worked out in the design room.

142. *Electrical Design:*—H. W. Price.

Department 7, III Year; 3 hours per week, both terms.

A design room is set apart for working out designs of electrical apparatus such as transformers, generators, motors, auxiliary apparatus, etc.

Special forms and notes are employed, arranged to suit the various studies. Certain models are provided to assist where necessary.

143. *Electricity:*—H. W. Price.

Departments 1, 2 and 8, III Year; 1 hour per week, both terms.

A continuation of Course 135, First Year, adapted to the requirements of non-electrical students. It deals with problems on direct-current circuits and apparatus; magnetic circuits; power measurements; alternating current principles and machinery; transmission; power-plants, etc.

144. *Electrical Laboratory:*—H. W. Price, A. R. Zimmer.

(*a*) Department 1.
III Year; 3 hours per week, first term.
IV Year; Options *d* and *e*, 3 hours per week, second term.

(*b*) Department 2.
IV Year; 3 hours per week, first term.

(*d*) Department 6.
III Year; 3 hours per week, second term.

(*e*) Department 8.
III Year; 3 hours per week, both terms.

These courses are arranged to suit the requirements of the departments concerned. The experiments are planned with the idea of affording a general knowledge of circuits, power measurements, direct-current and alternating-current machinery and transmission of power.

145. *Applied Electricity:*—(*a*) Symbolic and Graphical Methods,
(*b*) Wave Form and Transmission Line—T. R. Rosebrugh.

Department 7, IV Year; 2 hours per week.

(*a*) Complex quantities and their use in a.c. problems. Loci for current and voltage vectors for given limitations on circuit constants. Short line distribution circuit loci; approximate graphical theory of synchronous motor.

(*b*) Non-sinusoidal alternating current waves, analysis of waves, forms of symmetry, three phase limitations, elimination of undesired harmonics, heating of rotary converters; power, current, and voltage readings as influenced by wave form.

Long distance transmission line; principles and calculation. Unequal lines in tandem and in parallel.

Applied Electricity, (*c*) A.C. Machinery and Measurements:—H. W. Price.

Department 7, IV Year; 2 hours per week.

Polyphase alternating-current measurements of power, reactive power, apparent power, finding the indications of meters from given wiring diagrams, constructing wiring diagrams to obtain required meter indications. Potential and current transformers. Meter indications with distorted wave forms. Power transformers. Properties of alternators; induction motors of squirrel cage and wound-rotor types; synchronous motors; regulators; current-limiting reactors; arresters; and other general apparatus.

146. *Electrical Laboratory*:—A. R. Zimmer.

Department 7, IV Year, in connection with 145; 20 hours per week.

This laboratory course involves a thorough study of principles and properties of single and polyphase circuits and apparatus. Both vector and analytical methods are applied to the solution of problems based on tests made on laboratory machines.

The work deals mainly with constant-voltage and constant-current transformers, single and polyphase alternators, synchronous motors, rotary converters, induction and single phase commutating motors, transmission line, etc. The work does not consist only of factory tests, but is designed to lead the student to apply theory to practice as illustrated in the apparatus under test, with a view to an exact understanding of methods and an appreciation of limitations under many conditions. Free use is made of the oscillograph as a necessary device for "seeing" conditions under investigation. The best commercial measuring instruments are available.

147. *Radiotelegraphy*:—T. R. Rosebrugh.

Department 7. Option *r*, IV Year, in connection with 148; 2 hours per week.

Natural oscillations of simple and simply coupled circuits. Action of C.W. on circuits of the most general character. Radiation of antennas. Theory of modulation in radiotelephony. Energy control and transformation by vacuum tubes.

148. *Radiotelegraph Laboratory*;—C. I. Soucy.

Department 7. Option *r*, IV Year, in connection with 147; 9 hours per week.

The work in this laboratory covers the principles and the technique of measurements at radio frequencies. This includes measurements of wave length, resonance, coupled circuits, inductance, capacity, energy distribution, resistance, etc., at radio frequencies.

Considerable work is also done with the three electrode vacuum tube and its uses in radio and audio-frequency circuits.

ENGINEERING DRAWING AND DESCRIPTIVE GEOMETRY

160. *Descriptive Geometry:*—J. R. Cockburn.
Departments 1, 2, 3, 6, 7 and 8, I Year; 1 hour per week; both terms.
This course of lectures deals chiefly with the principles of orthographic and oblique projections and the application of such principles to the solutions of problems relating to straight lines and planes.

161. *Descriptive Geometry:*—J. R. Cockburn.
Department 4, I Year; 1 hour per week; both terms.
This course of lectures deals chiefly with the principles of orthographic and oblique projections and the application of such principles to the solution of problems relating to straight lines and planes, special reference being made to the determination of shades and shadows.

162. *Descriptive Geometry:*—J. R. Cockburn.
Departments 1, 2, 3 and 7, II Year; 1 hour per week, both terms.
This course of lectures is a continuation of the work taken in the first year with the following additions: Problems relating to curved surfaces, principles of shades, shadows and perspective.

163. *Descriptive Geometry:*—J. R. Cockburn.
Department 4, II Year; 1 hour per week, both terms.
This course of lectures is a continuation of the work taken in the First Year with the addition of problems relating to curved surfaces, shades, shadows and perspective.

164. *Descriptive Geometry:*—J. R. Cockburn.
Department 1, III Year; 1 hour per week, first term.
This course of lectures deals with spherical projections, the principles of mapmaking, and the graphical solution of spherical triangles.

166. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Departments 1, 2, 3, 7 and 8, I Year; 11 hours per week, first term; 18 hours per week, second term.
Copying from the flat, lettering, topography; graphical solution of problems in statics; problems in descriptive geometry, relating to both orthographic and oblique projections; the plotting of original surveys; measured drawings.

167. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Department 4, I Year.
Lettering, the graphical solution of problems in statics; problems in descriptive geometry, relating to both orthographic and oblique projections; measured drawings.

168. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Department 6, I Year; 8 hours per week, first term.
Copying from the flat, lettering, graphical solution of problems in statics, problems in descriptive geometry.

169. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.

Departments 1 and 2, II Year. Department 1, 4½ hours per week, first term; 13½ hours per week, second term. Department 2, 3 hours per week first term; 12 hours per week, second term.

Colouring and shading as applied to both topographical and construction drawings; problems in descriptive geometry relating to solids bounded by curved surfaces; principles of shades, shadows and perspective; solution of problems in optics and strength of materials; measured drawings; elementary design.

170. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.

Departments 3 and 7, II Year; Department 3, 15 hours per week, first term; 7½ hours per week second term; Department 7, 12 hours per week, both terms.

Colouring and shading as applied to construction drawings; problems in descriptive geometry relating to solids bounded by curved surfaces; principles of shades, shadows and perspective; solution of problems in optics, theory of mechanism and strength of materials; measured drawings; elementary design.

171. *Engineering Drawing:*—J. R. Cockburn.

Department 4, II Year.

Principles of shades, shadows and perspective; problems in descriptive geometry relating to solids bound by curved surfaces; solution of problems in strength of materials.

172. *Engineering Drawing:*—J. R. Cockburn, W. J. T. Wright.

Department 6, II Years; 7 hours per week, first term; 3 hours per week, second term.

Department 8, II Year; 3 hours per week, first term; 6 hours per week, second term.

(Same as Department 3 with the exception that Dept. 6 has no descriptive geometry.)

173. *Engineering Drawing:*—W. B. Dunbar.

Department 1, III Year; 15 hours per week first term; 12 hours per week, second term.

Principles of mapmaking, spherical projection; problems in theory of construction; original design of various structures.

174. *Engineering Drawing:*—W. B. Dunbar.

Department 2, III Year; 9 hours per week, first term.

Problems in theory of construction; original design.

177. *Engineering Drawing:*—W. B. Dunbar.

Departments 3, 6 and 8 (a), III Year; Department 3, 9 hours per week, first term; Department 6, 6 hours per week, first term; Department 8 (a), 6 hours per week, both terms.

Problems in design dealing with the theory of structures.

178. *Structural Design Drawing:*—W. J. Smither.
Department 1 (c), IV Year; 22 hours per week, both terms.
Problems in structural design.

179. *Structural Design Drawing:*—W. J. Smither.
Department 1*b*, IV Year; 5 hours per week, second term.
Department 1*d*, IV Year; 4 hours per week, first term; 8 hours per week, second term.
Department 1*e*, IV Year; 6 hours per week, both terms.
Problems in structural design.

180. *Structural Design Drawing:*—W. J. Smither.
Department 3, IV Year; 3 hours per week, first term.
Problems in mill building design.

181. *Structural Design Drawing:*—W. J. Smither.
Department 3, IV Year, Option (b); 3 hours per week, first term.
Problems in reinforced concrete design.

182. *Engineering Drawing:*—W. B. Dunbar.
Department 8, III Year; 3 hours per week, first term.
Plotting metallurgical flow sheets.

183. *Structural Design Drawing:*—J. Roy Cockburn.
Department 8 (a), IV Year; 6 hours per week, both terms.
Original design of ceramic plants, driers, kilns, etc.

184. *Vacation Work:*—J. R. Cockburn.
Departments 1, 2, 3, 4, 6, 7, II Year.
This work consists of construction notes which are to be neat and complete dimensioned sketches in pencil of any structures, machines or plants which may be of interest. Any object chosen should be represented and dimensioned in such a manner that it could be completely constructed from the notes as the only available information.

Vacation notes must be submitted to the Department of Engineering Drawing on or before the first day of the session.

Vacation notes must be on construction only, and contains not less than twenty, nor more than thirty pages of sketches (except in the Department of Architecture). These sketches must be freehand pencil drawings with figured dimensions.

Notes must be made in standard note books approved by the Faculty. Notes which have been taken during the session in connection with the work in drawing will not count as vacation work.

The minimum percentage of marks required for practical work must be made in the case of vacation notes.

ENGINEERING PHYSICS

185. (*a*) *Illuminating Engineering:*—G. R. Anderson.
Departments 3 and 7, I Year.
A course on the production and distribution of artificial light. Photometry and illumination calculations. Principles of interior lighting.
Lectures and laboratory work, both terms.

185. (*b*) *Geometrical Optics:*—G. R. Anderson.
Departments 1 and 6, I Year.
Nature of light, reflection, refraction, and dispersion. Theory of optical instruments. Polarization of light and its applications.
Lectures and laboratory work, both terms.

186. *Hydrostatics:*—G. R. Anderson.
Departments 1, 6, 7, II Year; Department 3, II Year, lectures only.
Laws of fluid pressure and application to machines. Density of solids, and fluids. Theory of flotation.
Lectures and laboratory work, second term.

187. *Heat:*—G. R. Anderson.
Departments 1, II Year.
Generation and propagation of heat. General and industrial thermometry, calorimetry and pyrometry. Linear and cubical expansion, gas laws. Specific heat of solids, liquids and gases, latent heat of fusion and vaporization. Mechanical equivalent of heat. Carnot cycle.
Lecture and laboratory work. Fall term.

188. *Photography:*—K. B. Jackson.
Department 1, II Year.
The camera and its adjustments, lenses, shutters, screens. Plates for various purposes, films, prevention of halation. Lighting, exposure, development. Paper of various kinds, printing, enlargement and reduction, blue printing and allied processes. Record photography, photogrammetry and photo-surveying. Photography in colour.
Lectures Fall term, and laboratory work both terms.

189. *Illumination:*—G. R. Anderson.
Department 4, II Year.
A special course on interior illumination, and the design of lighting installations for private and public buildings.

190. *Acoustics:*—G. R. Anderson.
Department 4, III Year.
Elementary acoustics, including production of sound by vibrating bodies. Special attention to the acoustics of buildings including the properties and uses of deadening material and calculations of reverberation.

191. (*a*) *Acoustics:*—G. R. Anderson.

Department 7r, IV Year.

Wave motion, Fourier's theorem, laws of vibrating systems, musical scales. Reflection and refraction of sound waves.

Combined lecture and laboratory course, first term only.

191. (*b*) *Photographic Surveying:*—G. R. Anderson.

Department 1a, IV Year; 1 hour lecture and 2 hours laboratory, first term.

This course presupposes a general knowledge of photographic processes as given in the second year. Treatment of a photograph as a perspective drawing from which plan and elevation to scale may be obtained under certain conditions. The intersection method of photographic surveying, its advantages and limitations. The stereoscopic method with its advantages and disadvantages. Method of plotting. Accuracy of results.

192 *Illumination Design:*—G. R. Anderson.

Department 7i, IV Year.

The design, installation and maintenance of artificial lighting for commercial and industrial operations. Street lighting. Economics of illumination.

GEOLOGY

193. *Field Work:*—E. S. Moore.

Department 2, III Year; one week preceding the opening of the first term.

194. *Pleistocene Geology and Physiography:*—A. MacLean.

Departments 2 and 8 (a), IV Year; 1 hour per week, both terms.

Pleistocene Geology.—Lectures on the formation and distribution of the drift deposits of North America, with brief references to other regions. Glacial, Interglacial, and Postglacial beds are described, changes of climate are discussed with their probable causes, and the economic features of the clays, sands, and gravels are pointed out.

Physiography.—A course of lectures on the surface forms of the earth, with the geological factors which have produced them. The broad features of the earth, its plains, tablelands, hills, valleys, mountains, oceans, rivers, and lakes are discussed in a general way; methods of topographical surveying and mapping are referred to, and the chief physiographic areas of Canada are described.

Works of Reference:—Ice Ages, Recent and Ancient—Coleman; Physiography—Salisbury.

195. *Elementary Geology:*—W. A. Parks.
Departments 1, 2, II Year; 2 hours per week, second term.
This course deals chiefly with historical geology with special reference to Canadian formations.
Works of Reference:—Introduction to Geology—Scott; Elementary Geology—Coleman and Parks.

196. *Geology and Ore Deposits:*—A. MacLean.
Department 8, II Year; 2 hours per week, both terms.
Lectures and laboratory work on historical, structural, and economic geology, designed to familiarize the student with the more important principles, facts, and terms of general geology.
Works of Reference:—As in Course 195.

197. *Engineering Geology:*—A. MacLean.
Department 1 and 8 (a), III Year; 1 hour per week, both terms.
This course deals with the application to engineering of dynamic, structural, and economic geology.
Works of Reference:—Engineering Geology—Ries and Watson.

198. *Dynamic and Structural Geology:*—A. MacLean.
Department 2, III Year; 1 hour per week, first term.
Lectures on geological forces and their effects. Particular attention is given to those aspects of the subject which apply in mining.

199. *Precambrian Geology:*—E. S. Moore.
Department 2, IV Year; 2 hours per week, first term.
Lectures on the Precambrian formations of Canada—their rocks, distribution, relationships, and economic features. Briefer accounts are given of similar formations in the United States and elsewhere.
Works of Reference:—Reports of the Geological Survey of Canada and of the Ontario Department of Mines; Reports of the United States Geological Survey.

200. *Mining Geology:*—E. S. Moore.
Department 2, IV Year; 2 hours per week, second term.
A course of lectures on geological problems associated with mining, typical mining regions in Canada, the United States, and elsewhere being discussed from the geological side.
Works of Reference:—Mineral Industry; Geology Applied to Mining—Spurr; and the works mentioned under Course 199.

201. *Geological Excursions:*—The Staff in Geology.
Departments 2 and 8 (a), IV Year.
During October and November weekly trips will be made to points of interest near Toronto.

202. *Economic Geology:*—E. S. Moore.
Department 2, III Year.

(*a*) *Ore Deposits:* 1 hour per week, both terms.

Discussion of the origin and classification of ore deposits, the mode of occurrence of the chief ores, and statistics of production. Special attention is given to the metals mined in Canada.

(*b*) *Economic Geology of the Non-metals:* 2 hours per week, second term.

Lectures on the origin and mode of occurrence of the valuable non-metallic substances—coal, oil, building stone, gypsum, cement materials, etc.

Works of Reference:—Economic Geology—Ries; General Economic Geology—Emmons; Ore Magmas—Spurr; Coal—Moore; Practical Oil Geology—Hager.

203. *Economic Geology:*—E. S. Moore.

Department 2, III Year; 2 hours per week, second term.

Laboratory work on ores, manner of occurrence, vein structure, etc., also the examination and construction of geological maps and sections of typical mining regions.

204. *Special Geology:*—A. MacLean.

Department 1 (e), IV Year; 1 hour lecture and 1½ hour laboratory work per week, second term.

A lecture and laboratory course on superficial geology, physiographic control, water geology, etc.

Works of Reference:—Political and Commercial Geology—J. E. Spurr.

HYDRAULICS

205. *Hydraulics:*—R. W. Angus.

Departments 1, 2, 3, 6, 7, III Year; 2 hours per week, both terms.

This is a course of lectures in hydraulics devoted to the development and discussion of formulae relating to the flow of water in pipes, the measurement of discharge by various methods, such as orifices and weirs, the conditions of flow obtaining in open channels, artificial and natural, and in pipes flowing partially full, together with other kindred subjects.

The object of this course is to provide the student with a good working knowledge of the fundamental principle of hydraulics, such as is useful in practical work, and is necessary to the intelligent investigation of more advanced problems, such as the design of water supply, sewerage and irrigation system, and water power plants.

206. *Hydraulic Laboratory:*—R. W. Angus, R. Taylor.

Departments 1, 2 and 3, III Year; one 3 hour period per week, second term.

Departments 6, 7, III Year; 4 periods of 3 hours each.

The work in this course is intended to illustrate the lecture course given in hydraulics and to give the student some working acquaintance with the formulae met with in practice. Experiments are made to determine the coefficients for orifices of the various types used in practice and for a weir. The results of these experiments are used in measuring the discharge in subsequent experiments on meters and for the determination of hydraulic resistances in various cases of flow in pipes. The complete course illustrates very fully the application of the course of lectures to actual cases.

207. *Hydraulics:*—R. W. Angus.

Departments 1 (d), 3 and 7 (d), IV Year; 1 lecture per week, both terms.

A course of lectures dealing with the various problems of unsteady flow such as occurs in power lines, penstocks, etc. Much of the work is done by the process of arithmetic integration, and the lecture work is supplemented by problems solved by the students in the work rooms, the time for which is included in course 209. Surges, water hammer, stream flow data, etc., are discussed.

The problems of collection of water for power purposes, use of the mass curve, rainfall and evaporation, turbine governing, etc., are also treated as far as possible.

208. *Hydraulics:*—R. W. Angus.

Departments 1 (d), 3 and 7 (d), IV Year; 2 lectures per week, both terms.

The most important question considered and to which most of the lectures are devoted is the theory of turbines and centrifugal pumps, the effect of the design on the speed, discharge and efficiency being fully taken up. The course includes the selection of turbines and pumps for given service intakes, draft tubes and all matters connected with hydraulic power plants.

209. *Hydraulics:*—R. W. Angus, R. Taylor.

Departments 1 (d) and 7 (d), IV Year; about 10 hours per week in 3 hour periods, both terms; Department 3, average of 7½ hours per week in 3 and 2 hour periods.

A laboratory course devoted to experimental work on turbines of various types and centrifugal and turbine pumps and other similar devices. This experimental work is arranged to illustrate the lectures on turbine and pump design. The experiments are made on hydraulic models and on two large turbine pumps used in the

laboratory supply, as well as on apparatus specially designed for instruction. Various methods of measuring water-power and the efficiency of machines are also given. A list of the equipment now available, and which is used in this course, is given at the end of the Calendar.

210. *Hydraulic Laboratory;*—R. W. Angus, R. Taylor.
Department 8, IV Year; 3 hours per week, second term.
A laboratory course of experiments on orifices, weirs, meters, etc. See No. 206.

211. *Hydraulics:*—R. Taylor.
Department 1_b, 1_e, IV Year; one hour lecture per week, first term.
A laboratory course of 3 hours per week, first term, on measurement of water, flow in open channels and on pumps.

212. *Hydraulics:*—R. Taylor.
Department 3, IV Year; one hour lecture per week, both terms.
A lecture course on pumps and other hydraulic machinery.

HEAT ENGINES

216. *Steam and Heat Engines:*—E. A. Allcut.
Departments 3 and 7, II Year; 1 lecture per week, both terms.
Departments 2 and 8, II Year; 1 lecture per week, first term.
A course of lectures dealing with the history and development of the steam engine with special reference to the theory and design of valves and valve operating mechanisms. The principles of heat engines and the various forms of heat engine are also discussed briefly.

217. *Thermodynamics:*—E. A. Allcut.
Departments 3, 6 and 7, III Year; 2 lectures per week, both terms.
In this lecture course the laws of heat are used to develop the characteristic equation for a perfect gas and the use of thermal lines on the pressure-volume diagram. The properties of Carnot's cycle are then considered, followed by application of these principles to the hot-air engine, internal combustion engine and air compressor. A consideration of the properties of vapours and their application to the steam engine cycle concludes the course.

218. *Heat Engines:*—E. A. Allcut.
(*a*) Departments 3 and 7, III Year; 1 lecture per week, both terms.
This course of lectures is intended to supplement the general lecture course in Thermodynamics by showing the practical application of the laws discussed therein. The laws of combustion, their application to the boiler practice and the generation and uses of steam are the principal points considered.

(*b*) Department 3, III Year; 1 lecture per week, both terms.

These lectures are a further development of the internal combustion work commenced in the Second Year, the influence of thermodynamic considerations on the design of heat engines, and problems in heat transfer, being discussed. The laws of heat transmission and their influence on Heating and Ventilation problems are also considered.

219. *Thermodynamics and Mechanical Laboratory:*—R. W. Angus, E. A. Allcut, J. E. B. Shortt.

Department 3, III Year; one 3 hour period per week, both terms.

Department 7, III Year; 3 hours per week, first term; 1 hour per week, second term. Time to be in three-hour periods.

This laboratory course is designed to assist in a clearer understanding of thermodynamics, machine design and mechanics of machinery. The work in thermodynamics consists in the setting of slide valves, indicating engines measuring the brake horse-power, simple engine and boiler tests and the testing of gas and gasoline engines under various conditions. The mechanical laboratory work deals with the efficiency of belts as well as of several machines of simple construction. An examination of lubricating oils is also made by means of well-known methods. Experiments are also made on the balancing of reciprocating and rotating masses.

220. *Thermodynamics:*—E. A. Allcut.

Departments 3 and 7 (f), IV Year; 2 lectures per week, both terms.

This is a continuation of course 217, the general thermodynamic theory being studied from the conception of the thermodynamic surface. The theory of the flow of gases and vapours through orifices, nozzles and pipes is then discussed and its application to the various forms of turbines is outlined. Following this, the principles of refrigeration, binary fluid engines, internal combustion engines and heat transmission are dealt with.

221. *Heat Engines:*—E. A. Allcut.

Departments 3 and 7 (f), IV Year; 1 lecture per week, both terms.

This course is a continuation of the lectures on heat engines given in the Third Year, with special application to the steam power plant. The causes of the various losses occurring in steam engines and the considerations that influence them are studied in detail. Special attention is given to condensing plants, consumption records and other factors upon which the efficiency of a power plant depends; also problems in heat transmission.

222. *Thermodynamics;*—R. W. Angus, E. A. Allcut, J. E. B. Shortt.

Departments 3, IV Year; average $7\frac{1}{2}$ hours per week, and 7 (f), IV Year about 9 hours per week, all in 2 or 3 hour periods.

The work in this year is a continuation and extension of the work covered in the third year laboratory course. Careful tests are made of heaters and of engines of various types, such as simple, tandem and cross-compound steam engines; steam turbine; refrigerating machine; injectors and steam pumps, etc.; and an application is made of Hirn's analysis and the entropy diagram to the results obtained. A complete set of experiments is made on each machine and the result plotted so as to show clearly to the student the effect of various alterations in the adjustment of the engine on the resulting efficiency.

Several modern gas and gasoline engines give ample opportunity for the study of this type of engine, and facilities are provided for sampling the gas supply and exhaust.

Two experimental stacks and three boilers enable results to be obtained on boiler efficiency and chimney draft.

223. *Thermodynamics:*—E. A. Allcut.

Departments 1 and 8 (a), III Year; 1 lecture per week, both terms

Departments 2 and 8, IV Year; 1 lecture per week, both terms.

The general principles of thermodynamics, the properties of a perfect gas and their application to the Carnot cycle are first studied. This is followed by a consideration of the air compressor cycle, some details of air compressor operation and the theory of the flow of air through pipes and orifices. The properties of vapours and the principles of steam engine operation are also discussed.

224. *Thermodynamic Laboratory:*—J. E. B. Shortt.

Departments 1, 6 and 8 (a), III Year; seven three hour periods, second term; Departments 2 and 8, IV Year; 3 hours per week, first term.

A course of experiments with steam and gas engines, compressed air, etc.

225. *Motive Power:*—R. W. Angus.

Department 1 (e), IV Year; one hour per week, both terms.

A course of lectures covering boiler capacity, locomotive horse-power, tractive effort, etc., necessary to carry specified trains over different conditions of roadbed.

MACHINERY

230. *Theory of Mechanism:*—J. H. Parkin.

Departments 3 and 7, II Year; lectures 2 hours per week; problems 1½ hours per week, both terms.

This course of lectures treats of the elementary construction of machines and of the motions of the various parts. Methods of determining linear and angular velocities, methods for the solution of elementary problems involving forces and methods for the determination of the mechanical efficiency of machines

are discussed. Velocity diagrams, crank effort and torque diagrams are plotted. Cams, toothed gearing and various types and applications of trains of gearing are considered.

Applications of the methods described are made to various machines including engines, machine tools, link motions, etc., and the lecture work is followed up by the solution of numerous examples in the drafting room.

Text Book:—Theory of Machines—Angus.

231. *Mechanics of Machinery:*—J. H. Parkin.

Departments 3 and 7, III Year; 1 hour per work, both terms.

This course is devoted to a consideration of the speed regulation and balancing of machines, and comprises lectures on the theory of various forms of governors, kinetic energy of machines and determination of speed fluctuations, the proper weight of fly-wheel, acceleration and inertia effects, and balancing.

The methods of analysis employed are those developed in course 230.

Text Book:—Theory of Machines—Angus.

232. *Elementary Machine Design:*—W. G. McIntosh.

Departments 3, 6 and 7, II Year; 1 hour per week, both terms.

This is a preparatory course intended to familiarize the student with the different shop methods and processes, casting, forging, machining, etc., used in the production of machine parts, to enable him to make proper provision in the design of such parts to facilitate their production.

In addition, the various standards, machine and pipe threads, tapers, pipe fittings, etc., are described and mechanical drafting room practice explained.

Tolerances, limits, fits and gauges are discussed.

The design of simple machine fastenings and parts is taken up and examples worked out in the drafting room.

233. *Machine Design:*—J. H. Parkin and W. G. McIntosh.

Departments 3 and 7, III Year; 2 lectures per week, both terms.

The design work averages 7 hours per week for Department 3, and 4 hours per week for Department 7, the periods to be of not less than 2 hours' duration.

The lectures in this course deal with the design of various machine elements, including shafting, bearings (journal, thrust, ball and roller), belts, pulleys, fly-wheels, clutches, springs, machine frames, etc.

The problems worked out in the drafting room are planned to include the design of all of the above and with a view to developing the student's judgment and sense of proportion in design.

Text Book:—Principles of Machine Design—Norman.

234. *Machine Design:*—W. G. McIntosh.
Department 6, IV Year; Department 8 and 8 (a), III Year; Department 2, II Year; 1 lecture per week, both terms.
The design work occupies 3 hours per week for the second term only.
The lectures in this course deal with the design of various machine elements, particularly those likely to be met with in Chemical and Metallurgical plants, and in mining work.
The problems worked out in the drafting room are designed to give the student training in the general lay-out of shafting and plant machinery, as well as in the design of simple parts for chemical and metallurgical apparatus, and mine machinery.

235. *Advanced Machine Design:*—J. H. Parkin and W. G. McIntosh.
Department 3, IV Year; 2 lectures per week.
The design work averages 7 hours per week, the periods to be of not less than 2 hours' duration.
The work of this course is devoted to the design of complete machines with the object of giving the student practice not only in the design of various details, but also in working in the various elements into a machine of smooth and harmonious design. The machines chosen as examples for design involve as many new machine elements as possible in order to broaden the training of the student.
Text Book:—Principles of Machine Design—Norman.

MATHEMATICS

236. *Calculus:*—M. A. Mackenzie and S. Beatty.
All Departments, I Year; 2 hours per week, each term.
Treatment of limits with special reference to those pertaining to exponentials and logarithms. Derivation of the fundamental formulae of the differential and integral calculus, with early application to simple problems concerning graphs, areas, volumes, lengths, etc.

237. *Calculus:*—M. A. Mackenzie and S. Beatty.
Departments 1, 3, 6 and 7, II Year; 2 hours per week, each term.
Continuation of course 236. The elementary theory reviewed and extended. Special attention to applications with problems in Engineering mostly in view.

238. *Analytical Geometry:*—I. R. Pounder and D. A. F. Robinson.
All Departments, I Year; 1 hour per week, first term, 2 hours per week, second term.
The course in Elementary Analytical Geometry covers the more familiar propositions in connection with the straight line, circle, parabola, ellipse and hyperbola. The subject is treated so as to illustrate the general methods of analytical geometry.

239. *Trigonometry, Spherical:*—L. B. Stewart.

Department 1, II Year; 1 hour per week, first term.

A course of lectures includes the derivation of formulæ and their application to the solution of triangles and to practical problems.

Text Book:—Spherical Trigonometry—Todhunter and Leatham.

240. *Least Squares, Method of:*—L. B. Stewart.

Department 1, III Year; 1 hour per week, second term.

The course of lectures includes: The general principles of probability, the law of error, direct measurements of equal and different weights; mean square and probable errors; indirect measurements; conditioned observations; applications to empirical constants and formulæ, etc.

Text book:—Least Squares—Merriman.

METALLURGY

241. *Elementary Metallurgy:*—G. A. Guess.

Departments 1, 2, 3, 6 and 8, II Year; 1 hour per week, second term.

A course of about 12 lectures on furnace metallurgy and present practice, with special reference to iron and steel.

242. *Fuels and Combustion:*—G. A. Guess.

Department 8, II Year; 1 hour per week, both terms.

A lecture course dealing with fuels, their use, preparation, calorific value and combustion.

243. *Metallurgy:*—G. A. Guess.

Departments 2, 6, III Year; 1 hour per week, both terms.

Fuels, temperature of combustion, specific heat, conductivity and problems thereon; chimneys, furnaces, refractories, outline of furnace metallurgy and hydro-metallurgy.

244. *Physical Metallurgy:*—J. A. Newcombe.

Departments 2, 3, 6 and 7, III Year; 2 hours per week, second term.

The physical properties and structure of iron and steel and the more common alloys.

245. *Metallurgy:*—G. A. Guess, J. E. Toomer.

Department 8, III Year; 2 hours per week, first term; 1 hour per week, second term.

A lecture course on General Metallurgy accompanied by 3 hours laboratory per week, first term, and 6 continuous hours per week second term.

246. *Physical Metallurgy:*—J. A. Newcombe.

Department 8, III Year; 1 hour per week, both terms.

Changes of phase and of state, pyrometry, preparation of alloys, miscibility of metals, binary, ternary and complex alloys, the use of the microscope, with 3 hours laboratory per week, first term.

247. *Metallurgy:*—G. A. Guess, J. E. Toomer.
Departments 2 and 6 (k), IV Year; 1 hour lecture per week, both terms; 6 continuous hours laboratory per week, second term.
General metallurgy and metallurgical problems.

248. *Metallurgy Problems:*—G. A. Guess, J. E. Toomer.
Department 8, IV Year; 2 hours lecture and 4 hours laboratory, both terms.
Metallurgical book-keeping, balance sheets, thermal balance sheets, methods and processes.

249. *Metallurgy:*—G. A. Guess.
Department 8, IV Year; 1 hour per week, both terms.
Critical reading and discussion of papers and articles, describing metallurgical processes or dealing with plant arrangement and construction. Metallurgical flow sheets of typical plants.

250. *Physical Metallurgy:*—J. A. Newcombe.
Departments 6 (k) and 8, IV Year; 1 hour lecture and 3 hours laboratory per week, both terms.

251. *Metallography:*—J. A. Newcombe.
Department 2, IV Year.
A laboratory course of 3 hours per week, second term.

252. *Physical Metallurgy:*—J. A. Newcombe.
Department 1 (c), (d) and (e), IV Year; 1 hour per week, both terms.
The physical properties of metals and alloys used in Civil Engineering practice—specifications.

253. *Heat Treatment of Iron and Steel:*—J. A. Newcombe.
Department 3, IV Year; 1 lecture per week, both terms.
Heat treatment of iron and steel, case carburizing, case hardening and malleableizing.

CERAMICS

254. (*a*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 4 hours per week, first term; 2 hours per week, second term.
Lectures covering origin, properties and classification of clays and other ceramic materials from a mnaufacturing standpoint; methods of manufacture, including preparing, shaping and burning clay ware.

254. (*b*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 2 hours per week, second term.
Lectures on the composition of clear and coloured glazes.

254. (*c*) *Ceramics:*—J. E. Toomer.
Department 8 (a), III Year; 1 hour per week, second term.
Lectures and problems on calculations necessary for the compounding of ceramic bodies and glazes.

254. (*d*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 6 hours per week, both terms.
Work on the identification and testing of clays.

254. (*e*) *Ceramics:*—J. E. Toomer.
Department 8 (a), III Year; 6 hours per week, both terms.
Laboratory practice in the analysis of ceramic materials.

254. (*f*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 2 hours per week, first term.
Lectures on composition and properties of refractory material; composition of bodies made with ceramic material, with special reference to white-ware and porcelain.

254. (*g*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 2 hours per week, second term.
Lectures on the manufacture and composition of glass; manufacture and composition of iron enamels.

254. (*h*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 1 hour per week, first term.
Lectures on specifications, testing and methods of testing ceramic materials.

254. (*i*) *Ceramic Laboratory:*—R. J. Montgomery.
Department 8 (a), IV Year; 9 hours per week, both terms.
Advanced work on compounding and testing ceramic bodies and glazes.

MINERALOGY

255. *Elementary Mineralogy:*—J. E. Thomson.
Department 2, I Year; Department 8 (a) III Year; 2 hours per week, first term.

After introducing the student to the chief chemical, physical, and crystallographic characteristics of minerals, the course becomes descriptive and deals with about one hundred of the minerals most important from the industrial or scientific point of view.

Text Book:—Study of Minerals and Rocks—Rogers.

256. *Mineralogy:*—J. E. Thomson.
Departments 6 and 8, I Year; 2 hours per week, first term; 1 hour per week, second term.
Introduction to determination of minerals by inspection and physical tests.
Text Book:—Mineral Tables—Eakle.

257. *Primary Mineralogy:*—A. L. Parsons.
Department 1, II Year; 2 hours per week, first term.
A very brief introduction to the study of minerals and rocks.
Text books:—Study of Minerals and Rocks—Rogers; Hand-Book of Rocks—Kemp.

258. *Mineralogy:*—J. E. Thomson.
Department 2, I Year; 1 hour per week, first term; 3 hours per week, second term.
Department 8 (a), III Year; 1 hour per week, first term.
Determination of minerals by inspection and by means of physical tests; introduction to blow-pipe practice.
Text books:—Mineral Tables—Eakle; Determinative Mineralogy—Lewis.

259. *Mineralogy:*—A. L. Parsons, J. E. Thomson.
Department 1, II Year; 1 hour per week, first term; 2 hours per week, second term.
Determination of minerals by inspection and by means of physical tests; study of common rock types and their identification.
Text books:—Mineral Tables—Eakle; Handbook of Rocks—Kemp.

260. *Elementary Petrography:*—T. L. Walker.
Department 2, II Year, and Department 8 (a), III Year; 1 hour per week, both terms.
A course of lectures and laboratory work introducing the student to the macroscopic study of rocks.
Text books:—Handbook of Rocks—Kemp.

261. *Mineralogy:*—J. E. Thomson.
Department 2, II Year; 2 hours per week, both terms.
Determination of minerals by means of the blow-pipe and physical properties.
Text books:—Mineral Tables—Eakle; Determinative Mineralogy—Lewis.

262. *General Petrography:*—A. L. Parsons.
Department 2, III Year, and Department 8 (a), IV Year; 1 hour per week, both terms.
Study of the chief rock-forming minerals and of some phases of petrography not covered in the course of the previous year.
Text Books:—Minerals in Rock-Sections—Luquer; Petrology for Students—Harker.

263. *Petrography:*—T. L. Walker.
Department 2, III Year, and Department 8 (a), IV Year; 2 hours per week, both terms.
Study of the chief rock-forming minerals, of rocks in thin sections and in hand specimens.
Text books:—Petrology for Students—Harker; Minerals in Rock Sections—Luquer.

MODERN LANGUAGES

266. *French:*—J. H. Cameron, Miss J. C. Laing, L. A. Bibet.
Required in Department 4, I and II Years; 2 hours per week, both terms; III Year, 1 hour per week, both terms.
(*a*) Practice in translation of selected texts bearing on some phase of architectural study.
(*b*) A course in Conversation to encourage the student to acquire a speaking knowledge of the language.

267. *German:*—B. Fairley, T. J. Hedman, G. E. Holt.
Department 6, all years; I Year, 2 hours per week, both terms; II, III, IV Years, 1 hour per week, both terms.
An elementary course intended to train the student in the translation of scientific journals and treatises.

268. *Spanish:*—M. A. Buchanan.
Departments 6*k*, IV Year; 8, II Year; 1 hour per week, both terms.
An introduction to Spanish grammar, pronunciation and practice in reading Engineering Spanish.

PHYSICAL TRAINING

269. *Physical Training:*—G. D. Porter.
Required in all departments, I and II Years, and optional in the III and IV. Years.
By order of the Board of Governors each male student proceeding to a degree must take Physical Training in the first and second years of his attendance. In each session in which Physical Training is compulsory he must first undergo a medical examination by the Director of the University Health Service, and must then register for Physical Training at the office of the Athletic Association in Hart House. Students of all years who wish to take part in any form of athletics or physical exercise, must first undergo a medical examination by the Director. Those classified as A1 may elect to take any form of competitive athletics during the season in which that form of sport is in progress.
Military training in the C.O.T.C. constitutes an option in Physical Training (see page 128).

SURVEYING

270. *Surveying:*—S. R. Crerar.
Departments 1, 2, 3, 7 and 8, I Year; 1 hour per week, both terms.
The lecture course includes the general principles; surveying with the chain, the compass and chain and the transit and chain, and level, the applications of trigonometry to inaccessible heights and distances; mensuration of surfaces, co-ordinate surveying, division of land, etc.

Text books:—Plane Surveying—Tracy; Theory and Practice of Surveying—Johnson and Smith; Elementary Surveying—Breed and Hosmer.

271. *Field Work:*—S. R. Crerar, J. W. Melson.
Departments 1, 2, 3, 7 and 8, I Year; 6 hours per week, first term.
This course comprises testing chains; practice in chaining; a complete survey of a piece of land with the chain and transit; keeping of field notes; the use of the transit and compass in surveying closed figures and traverse lines and in ranging straight lines; plotting by latitudes and departures, and otherwise computing areas. Instrumental work with level, including roadway improvement.

272. *Surveying:*—W. M. Treadgold, E. W. Banting.
Departments 1 and 2, II Year; 1 hour per week, both terms.
This course of lectures takes up in detail, simple, reverse and compound curves as applied to railroad surveying. It also includes stadia, plane table and photographic surveying as applied to topographic work, and the main features of mine and hydrographic surveying.
Text books:—Henck, Searles, Allen (Field books for Engineers) Theory and Practice of Surveying—Johnson and Smith; Surveying—Breed and Hosmer.

273. *Field Work:*—W. M. Treadgold, E. W. Banting.
Department 1, II Year; 9 hours per week, first term.
Department 2, II Year; 6 hours per week, first term.
This course of instruction embraces all adjustments of the transit and level, minor problems in triangulation and traversing—levelling and plane table practice.

274. *Surveying and Levelling:*—W. M. Treadgold.
Department 1, III Year; 1 hour per week, both terms.
This course of lectures takes up the work of the railroad engineer on construction, including profiles, cross sectioning, computation of volume of earthwork, overhaul, transition curves, laying out turnouts, frogs and switches, etc.
Also a discussion of trigonometric and barometric levelling.
Text books:—Field Engineering—Searles; Railroad Curves and Earthworks—Allen.

275. *Survey Camp:*—W. M. Treadgold, S. R. Crerar, E. W. Banting, J. W. Melson.
Departments 1 and 2, III Year; Department 1a, IV Year.
This course includes:
(*a*) Secondary Triangulation and Base Line Measurements.
(*b*) Stadia, Plane Table and Boundary Traverses.

(*c*) Highway and Railway Location.
(*d*) Cross Sectioning and Computation of Earthwork.
(*e*) Stream Gauging and Discharge Measurements.
(*f*) Hydrographic Surveying.
(*g*) Photographic and Micrometer work.
(*h*) Stadia and Plane Table Topography.
(*i*) Mine Surveying.
(*j*) Observations for Time, Azimuth and Latitude.
(*k*) Geological Survey.

This work is taken at Gull Lake Camp. See page 34.

276. *Railroad Location and Design:*—W. M. Treadgold.

Department 1 (e), IV Year; 1 hour lecture per week, both terms; about 8 hours per week, both terms, in the drafting room.

This work will consist of an original survey for a railroad some one or two miles in length, the work to be carried out according to the most modern methods of location. Upon the completion of the field work, the complete survey will be plotted and a line adjusted to it. This will be staked out, profiles taken and the computation made of the earthwork and the preparation of overhaul diagram compiled for determination of haul and borrow. In the second term the design of track work, yards and practical problems will be taken up and special problems assigned.

ADDITIONAL FOURTH YEAR COURSES

280. *Sanitary Engineering:*—Peter Gillespie.

Department 1_b, IV Year; 1 hour lecture per week, both terms; 8 hours laboratory, first term; and 6 hours, second term.

Consideration is given to the problems of water supply, sewerage and sewage disposal as viewed by the engineer. Some practice in the design of works from assumed data is afforded. Excursions to places of interest are arranged from time to time.

Reference Books:—Public Water Supplies—Turneaure and Russell; American Sewerage Practice—Metcalf and Eddy, 3 vols.

281. *Highway Engineering:*—A. T. Laing.

Department 1_b, IV Year; 1 hour lecture and 3 hours laboratory per week, both terms.

This course of instruction deals with the design, construction and maintenance of public highways and street pavements, also with the properties of the materials employed. Accompanying the course of lectures is a laboratory course dealing with the various bituminous and non-bituminous materials of construction. Excursions to places of interest are arranged for during the fall term.

282. *Municipal Seminar:*—P. Gillespie, A. T. Laing.
Department 1_b, IV Year; 3 hours per week, both terms.
This time is devoted to reading, essay writing and discussion of problems relating to highways, transportation, town planning, sanitation and kindred subjects.

283. *Zymology:*—H. B. Speakman.
A study of the phenomena of fermentation and their industrial applications.

THESIS

285. *Thesis.*

Required in all Departments, IV Year, with the exception of Department 4, Architectural Design Option. Department 3, IV Year; 1 hour per week, both terms.

Each student must prepare a thesis on a subject and in a form approved by the head of the department in which the student is registered.

SCHOOL OF ENGINEERING RESEARCH

A School of Engineering Research, within the Faculty of Applied Science and Engineering, was established in the Spring of 1917 at the suggestion of the late Dean Ellis.

The School is under the direct supervision of a Committee of Management composed of fifteen Members of the Faculty Council. To this Committee is entrusted the selection of researches to be undertaken under the auspices of the School, and the disposition of funds conducting them.

The School was organized chiefly for the training of graduates in methods of research, and for the carrying out of investigations. These latter may be problems relating to specific industries or raw materials and having a specific end in view, or general problems having to do with fundamental principles.

A number of research assistants are appointed annually in the various departments of the Faculty to carry on the work of research under direction of members of the staff. The facilities of the School are also open to graduates who desire to penetrate more deeply into particular phases of experimental work, or to undertake investigations either suggested by members of the staff or arising from their own work since graduation.

Address communications to the Secretary—Professor Maitland C. Boswell, Ph.D.

ADVANCED COURSE IN HYDRO-ELECTRIC POWER

In view of the importance of Hydro-Electric power in Canada, further facilities are offered to those graduates who wish to supplement the present extensive undergraduate courses bearing upon this subject. Graduate studies may be pursued by candidates for the Degree of Master of Applied Science as soon as desired after graduation.

To those returning after satisfactory experience in some approved phase of Hydro-Electric work, somewhat more specialized courses may be given than are possible with very recent graduates. The Engineering Alumni Association of the University has expressed its willingness and desire to assist such candidates in obtaining suitable employment to fit them for these courses of study, but such courses are available only to those with the proper undergraduate preparation.

Graduates who may wish to avail themselves of the arrangements proposed are advised to communicate with the Dean.

It should be noted that candidates for post-graduate degrees register with the Secretary of the School of Graduate Studies. For further particulars see Calendar of the School of Graduate Studies and succeeding pages of this Calendar.

REGULATIONS FOR DEGREES OF MASTER OF APPLIED SCIENCE, MASTER OF ARCHITECTURE, CIVIL ENGINEER, MINING ENGINEER, MECHANICAL ENGINEER, ELECTRICAL ENGINEER, CHEMICAL ENGINEER, METALLURGICAL ENGINEER

A. The regulations governing the Degrees of Master of Applied Science and Master of Architecture for the session 1927-28 shall be determined as follows:

1*a*. A candidate for the degree of Master of Applied Science shall hold the degree of Bachelor of Applied Science of this University or a degree from some other University recognized as equivalent by the Council of the School of Graduate Studies.

1*b*. A candidate for the degree of Master of Architecture shall hold the degree of Bachelor of Architecture or the degree of Bachelor of Applied Science in Architecture of this University or a degree from some other University recognized as equivalent by the Council of the School of Graduate Studies.

2. He shall register with the Secretary of the School of Graduate Studies at the beginning of the academic year.

3. Not later than November 1, 1927, he shall submit to the Secretary for acceptance by the Council of the School of Graduate Studies the title of his proposed thesis as approved by the department concerned.

4. Not later than April 30, 1928, he shall present evidence to the Council of the School of Graduate Studies that he has spent not less than one academic year of the department concerned as a student enrolled in one of the following departments on a course of study approved by the department: Civil Engineering, Mining Engineering, Mechanical Engineering, Architecture, Chemical Engineering, Electrical Engineering, Metallurgical Engineering.

5. Not later than April 30, 1928, evidence that the candidate has satisfactorily met all the requirements of the department with regard to thesis and to such examinations as the department shall require, shall be forwarded to the Council of the School of Graduate Studies through the sub-committee administering the regulations governing the degrees of Master of Applied Science and Master of Architecture.

B. The regulations governing the Professional Degrees of Civil Engineer (C.E.), Mining Engineer (M.E.), Mechanical Engineer (M.E.), Electrical Engineer (E.E.), Chemical Engineer (Chem.E.), Metallurgical Engineer (Met.E.), for the Session 1927-28 shall be determined as follows:

1. A candidate for one of the said degrees shall hold the diploma of the School of Practical Science or of the Faculty of Applied Science and Engineering or the degree of Bachelor of Applied Science.

2. He shall have spent at least three years after receiving the diploma or the degree in the actual practice of the branch of engineering wherein he is a candidate for a degree.

3. Intervals of non-employment, or of employment in other branches of engineering, shall not be included in the above three years. It shall not be necessary that the several periods requisite to make up the said three years be consecutive.

4. Notice in writing shall be sent to the Secretary not later than the first day of November, informing him of the degree to which the candidate wishes to proceed and of the title of his proposed thesis for the approval of the Examiners.

5. Satisfactory evidence shall be submitted to the University Examiners as to the nature and length of the candidate's professional experience for the purpose of clauses 2 and 3, *i.e.*, a complete and detailed history of his professional activities from the date of graduation up to the time of application, stressing particularly that part of his experience that gave rise to his desire to prepare a thesis on the subject submitted for the approval of the University Examiners; together with certificate or certificates from former employers substantiating the statements as to the nature and duration of service enumerated.

The examiners may satisfy themeslves by oral or written examinations in regard to the candidate's experience and competence.

6. The candidate shall prepare an original thesis on some engineering subject in the branch in which he wishes a degree, the said thesis to be accompanied by all necessary descriptions, details, drawings, bills of quantities, specifications and estimates.

The candidate may be required at the option of the examiners to undergo an examination in the subject of this thesis.

7. The thesis, with accompanying papers, described in clause 6, shall be sent to the Secretary not later than the first day of March.

8. The candidate shall be required to present himself for examination in the month of April or at such time as may be arranged by the Examiners.

9. The thesis, drawings, and other papers submitted under clause 7 shall become the property of the University.

10. Nothing in this statute shall prevent any candidate from receiving more than one of the said degrees, provided he has the necessary qualifications for each degree. An interval of three years must elapse between the granting of any two degrees under this statute.

DEGREE OF DOCTOR OF PHILOSOPHY

Attention is called to the fact that the degree of Doctor of Philosophy (Ph.D.) is open to graduates of the Faculty of Applied Science and Engineering. Full information as to the conditions to be met by candidates for this degree will be found in the Calendar of the School of Graduate Studies, which may be obtained from the Registrar of the University.

In general this course involves, except under special circumstances, three years study in this University on one major subject and two minor subjects, and every possible effort will be made to meet the desires of candidates in the selection of these subjects.

Several graduates have already taken advantage of the opportunity thus offered, and others interested in this degree are requested to correspond with the Secretary of the School of Graduate Studies and are advised, in the first instance, to consult the Dean of this Faculty.

CERTIFICATE FOR HIGH SCHOOL ASSISTANT

The Calendar of the Ontario College of Education provides for the admission of the holder of a degree in Science to the Course for a High School Assistant's certificate. The regulation requires that the applicant shall submit with his application:

"His certificate of graduation as Bachelor or Master of Arts, Bachelor or Master of Science, Bachelor of Commerce, Bachelor of Agriculture, or Bachelor of Applied Science, from a British University, after the regular

university course approved by the Minister of Education as to entrance requirements and as to content of the undergraduate courses. Each applicant must have Upper School or Honour Matriculation standing in English and History and Mathematics or the equivalent of such standing."

SPECIALISTS' CERTIFICATES FOR HIGH SCHOOL TEACHERS

By an arrangement between the University and the Department of Education of the Province of Ontario, provision is made for graduates in Applied Science to obtain High School Specialists' Certificates under conditions which can be ascertained by reference to the Special Announcement of the University in connection therewith.

LABORATORY EQUIPMENT

THERMODYNAMIC AND MECHANICAL LABORATORY

The University in 1919 completed the erection of a large, well-equipped building for the accommodation of the steam, gas, mechanical and hydraulic laboratories. A more complete description of the laboratories has been published elsewhere, so that the present description is only intended to give the main features.

The part of the building set apart for thermodynamics and other mechanical work is the ground floor of a room 60 ft. x 155 ft. This room is lighted entirely from the roof in a very perfect way. A part of the space 40 ft. wide running the entire length of 155 feet is served by a 3 ton travelling crane and contains the following equipment:

50 h.p. Brown engine with separate jackets on both heads and barrel of cylinder.

Two-stage Rand air compressor having compound steam cylinders, each fitted with Meyer cut-off gear. The low pressure air cylinder has Corliss inlet gear.

30 h.p. high-speed Leonard tandem compound engine with shaft governor.

15 h.p. high-speed McEwen engine.

40 h.p. Uniflow engine.

25 h.p. General Electric steam turbine.

Two 15 h.p. Leonard engines with different types of valves, which are used for valve setting.

There are also two surface condensers with air pumps so arranged that any engine in the laboratory may be made to exhaust into the atmosphere through an open heater or into one of the condensers, the change from one arrangement to the other being accomplished in a few minutes without the aid of valves.

The laboratory further contains:

A 3 ton York refrigerating machine with tanks.

An Amsler transmission dynamometer.

Apparatus for testing injectors and steam pumps.

Hot blast heating equipment.

Numerous other pieces of apparatus and instruments.

The work on internal combustion engines and producers is performed on the following:

Experimental gas producer.

14 h.p. National gas engine arranged for various compressions and points of ignition.

10 h.p. Fielding and Platt engine for city gas or coal oil, having various adjustments

25 h.p. Allen semi-Diesel engine.

25 h.p. tractor gasoline engine.

Six cylinder Buick automobile engine.

200 h.p. Sprague electric dynamometer.

Various accessories to above machines.

Steam for the laboratory is supplied by two 50 h.p. and one 100 h.p. Babcock and Wilcox boilers, the latter having an internal superheater. These boilers are located in a separate boiler room. They are used for experimental work only and are fitted up for testing. The gases pass up through two independent chimneys, and these have been arranged so that the draft and other conditions in the chimney at any point of its height may be examined.

In smaller work-rooms off the main laboratory are placed belt and oil testing machines, apparatus for testing the efficiency of gears and machines, and for experiments in the balancing of machinery.

HYDRAULIC LABORATORY

The hydraulic laboratory occupies two floors each 40 feet x 112 feet, which are well lighted by large windows on the side and end.

The water for the experimental work is pumped through the various pieces of apparatus from a well by means of two turbine pumping units, both of which are driven by a Belliss and Morcom compound engine of 125 h.p. running at a speed of 525 revs. per minute. Both engine and pumps have been installed with a view to using them in experimental work as well as for supply of water for other apparatus used in the laboratory.

The pumping units are capable of delivering one cubic foot of water per second against heads of 250 feet and 300 feet respectively. These units are designed and connected up so that they may be run in series giving the above discharge at 550 feet head, or they may be run in parallel giving double the discharge at a lower head. Each pumping unit consists of two two-stage pumps mounted on a common base and driven by a single pulley, and the construction and piping are such that each two-stage pump may be driven separately or that all may be driven at once, discharging separately one cubic foot per second at about 125 feet head through each of four independent pipes, or else the pumps may be run in series or in parallel. The scheme is thus well adapted to laboratory work, and under the heads used on reaction turbines about six cubic feet per second may be obtained.

In addition to this there is an electrically driven pump capable of delivering six cubic feet per second at a head of sixty-five feet and which is most helpful in turbine testing. Attention is called to the special turbine testing flume described below.

The laboratory further contains a large vertical steel tank 5½ feet diameter by 34 feet with arrangements for the attachment of nozzles

and other mouthpieces, etc. Connections are also arranged for reaction turbines, the tank acting as a reservoir.

The discharge from the turbines or nozzles is measured in a weir tank nearly 6 feet wide and 21 feet long, containing a contracted weir 4½ feet wide. This weir may be calibrated by two weighing tanks, each having a capacity of about 240 cubic feet.

There are three reaction turbines and two impulse wheels all ready for experiment, the power being measured by brakes and the water by weir or orifices. Amongst the reaction turbines may be mentioned the one designed and built by Escher Wyss & Co., specially for the laboratory.

A new and specially designed turbine testing flume has recently been added to the laboratory, the machinery for which has been largely furnished through the kindness of the Dominion Engineering Works, Montreal, and Wm. Cramp and Sons, Philadelphia. This flume is supplied with water by a Moody spiral pump of twelve cubic feet per second capacity and at present there are two turbines, one of the propeller type, and also two special draft tubes and more will be added. This provides an excellent opportunity for experiment and research.

Smaller orifice and weir tanks, each about 3 x 3 x 12 feet with necessary measuring tanks, are arranged for instruction in coeficients of various kinds and practice with weirs and orifices.

A Venturi meter and other meters, also an hydraulic ram and similar devices are available for testing, and good facilities have been arranged for investigating friction and other properties of pipes and fire hose.

For special investigations on turbine and centrifugal pumps, other pumps in addition to those already described have been arranged.

The basement of the laboratory contains an open trough 5 feet wide, about 110 feet long, with a large weir at one end. It is intended to use this trough for experiments on the flow in open channels, for measurements of large discharges by means of the weir, and for experiments with current meters and Pitot tubes.

Numerous pieces of smaller apparatus, together with all instruments required, have also been provided, and the laboratory equipment is believed to be very complete.

AERODYNAMIC LABORATORY

The Aerodynamic Laboratory is located in a separate special building. The Laboratory is fully equipped with an improved 4-ft. Royal Aircraft Establishment type wind channel, aerodynamic balance, micromanometers and other necessary instruments.

Air speeds of 80 feet per second can be secured in a stream of great steadiness and uniformity and higher speeds with some sacrifice in steadiness.

The work done in the Laboratory includes the investigation of problems in aerodynamics, tests of air craft components, and complete machines, rating of meters, ventilators, radiators, etc., and the study of the effect of wind pressure on structures, chimneys, etc.

ENGINEERING PHYSICS LABORATORIES

Illuminating Engineering

The laboratories are equipped with ordinary and precision photometer benches with integrating mirrors and rotators, photometric spheres from 15 inches to 6 feet, portable illuminometers, spectro-phometer, etc. A room is also provided containing outlets for various types of industrial, commercial and house lighting units, for measurement of illumination values. For work in optics there is provided optical benches for the testing of lenses and instruction in the theory of instruments together with a general equipment of telescopes, field glasses, microscopes, sextants, etc.

Heat and Hydrostatic Laboratory

This laboratory is equipped with a full supply of apparatus required for the practical work in these subjects.

Acoustical Laboratory

The equipment here consists of forks, pipes, sonometers, etc., to illustrate the general work in this subject together with special equipment for work in architectural acoustics as taught to architects.

DONATIONS

Through the generous donations of the manufacturers of lighting equipment and accessories, a Lighting Demonstration Room to illustrate the latest practice in industrial, commercial and house lighting has been established as a permanent exhibit. The following companies have co-operated and their contributions are gratefully acknowledged:

All-American Radio Corp.
Benjamin Electric Co.
Bryant Electric Co.
Canadian General Electric Co.
Canadian Westinghouse Co.
Consolidated Glass Co.
Cutler-Hammer Co.
Cutter Co. per D. M. Fraser Ltd.
Curtis Lighting Inc.
Frank Adam Electric Co. per Taylor Mfg. Co.
Gleason-Fiebout Glass Co.
Hart Mfg. Co. per Bongard Ltd., Ivanhoe Division.
Jewell Instrument Co. per D. M. Fraser Ltd.
Miller Co.
Pittsburg Reflector Co. per Wilson Illuminating Co.
Tallman Brass Co.
Walcott Mfg. Co. per Bongard Ltd.
Wheeler Co. per C.G.E.

PHOTOGRAPHIC AND PROJECTION LABORATORIES

The Photographic Laboratory contains a supply of small cameras for the use of students, enlarging cameras, printers, blue printing machine and the necessary dark rooms.

This Department also carries on a photographic and projection service for all Faculties and Departments of the University. The equipment for this work consists of cameras for making photographs up to full plate size, enlargers, photo-micrographic apparatus, motion picture cameras for both gross and micro work, with the necessary developing and printing machines, a rotary blue print machine, a photostat, etc.

For projection service there is a motion picture projector and a number of projection lanterns for service in any University Building.

ELECTRICAL LABORATORIES

The Department of Electrical Engineering is located in the Electrical Building. The accommodation includes quarters for staff, library, lecture rooms, laboratories, stores, and shop for repairs and construction.

Services.—Three-wire direct-current, 110 kw., from the University power house, automatically regulated at our end for constant voltage of desired value at our main switchboard. Three-phase, 60 cycles, 60 k.v.a., 115 volts, automatically regulated as to voltage and frequency. Three-phase, 25 cycles, 30 k.v.a., automatically regulated as to voltage and frequency. Every laboratory has all three services available at convenient places. There are three main boards, one for each floor. A system of special trunk lines between boards, and tree systems on each floor, enable easy arrangement of any desired special connections from any laboratory to any other.

Alternating current laboratory.—Area 26 x 110 ft., service sets 60 and 25 cycles, Tirrill regulators. Two 60-cycle and two 25-cycle, 15 k.v.a. motor-generator sets; converters; various motors, squirrel cage and wound rotor induction types, repulsion and other single-phase types, unity power factor motor, polyphase motor with variable speed shunt characteristics and speed range of 4 to 1; transformers, single and three-phase; constant-current transformers with load of series arc lamps; lamp racks, reactors, condensers, brakes, etc.; oscillographs; indicating, graphic, recording, and demand meters of the best makes; all arranged to facilitate a very general line of experimental work.

Direct current laboratory.—40 kw. 230 to 115 volt motor generator set with Tirrill regulator for special tests. Numerous 5 kw. to 10 kw. motor-generator sets; shunt, series, compound motors; special interpole machines; loading racks, dynamometers, rheostats, numerous meters of first quality, etc., for any sort of study.

Measurements Laboratory.—26 x 110 ft. Fitted with very flexible storage battery service which can be connected to any desired working place; d.c. three-wire service, also 60 and 25-cycle three-phase everywhere; galvanometers, resistance boxes, bridges, shunts, potentiometers, standard cells, bond testers, ductor, megger, apparatus for measuring low resistances, artificial lines for fault measurements, condensers, inductances, rails, cables, voltmeters, ammeters, wattmeters, dynamometers, etc., for general work on a great variety of measurements.

High voltage laboratory.—For various lines of study with voltages up to 200,000 volts. Flexible and safe provision for control.

Materials laboratories.—One specially fitted for general work on conducting materials, one for magnetic materials, one for dielectric materials.

Radio laboratory.—Adapted for the measurement of various quantities of interest in this work, including the strength of incoming signals. One single conductor aerial 1,000 ft. long, one multi-conductor aerial 120 ft. long.

Standardizing laboratories.—One students' calibration room for direct-current meters, another for alternating-current meters. A standards room, constant temperature, for master standards of voltage, resistance, current, power, etc.

Research laboratories.—Four rooms set apart for this work, in combination with facilities of the other laboratories.

Design laboratory—Arranged for calculation work on apparatus selected to illustrate essential principles.

CHEMICAL LABORATORIES

The Chemical laboratories are situated in the western half of the Chemistry and Mining building, on the first and second floors. The rooms are large and well lighted, and are supplied with the usual modern equipment.

The first and second year laboratory for qualitative work has accommodation for 112 students, each working space being supplied with water, gas and fume cupboard. The laboratory for quantitative analysis will accommodate 48 students, and is supplied with commodious fume cupboards and all necessary apparatus. A laboratory with working places for 36 is provided for the students engaged in the study of technical chemistry; it is equipped with appliances for the preparation and testing of chemical products. Laboratories for fourth year students with accommodation for twenty workers has been fitted up. Each of these laboratories has its own balance room adjoining furnished with instruments from the best makers and adapted to the particular objects in view.

In addition there are rooms set apart for research, for gas analysis, and a specially constructed fireproof laboratory for combustion, crucible and bomb furnaces. Each of these laboratories is supplied with apparatus of the most approved design, providing excellent facilities for the prosecution of work in analytical and technical chemistry.

A room in the basement, set apart for the purpose, has been equipped, as a laboratory for carrying on chemical operations on a small factory scale.

ELECTROCHEMICAL LABORATORIES

The Electrochemical laboratories, which are situated in the Chemistry and Mining building, are provided with special facilities for electrolytic work, including a large storage battery and electroplating dynamo with tanks as well as a good set of apparatus and electrical measuring instruments. The experimental work on electric furnaces is carried out in a large furnace room in the basement, occupied jointly by this Department and the Department of Metallurgy. The equipment for this purpose comprises a 120 KW, 110 volt generator supplying direct current through a switchboard, rheostats, circuit-breaker and instruments to a set of distributing bus-bars, and a 200 KV-a transformer stepping down from 2200 volts to 30-120 volts in 3 and 6 volt steps, which supplies alternating current at 25 cycles. There is a complete set of A.C. instruments, circuit-breakers, oil-switches, relays, automatic regulating winches, etc., and a Northrup high frequency furnace with its transformer is also installed.

ASSAYING LABORATORIES

These are situated in the west end of the basement in the Mining Building. They consist of five rooms, in addition to a library for study and an instructor's room. The East laboratory, 17 x 47 feet, and the West laboratory, 28 x 37 feet, are equipped with coal, oil, gas, and electric furnaces of various design. A Hoskin's electric resistance furnace has an automatic temperature regulator and a voltage control. Each room has a fume cupboard, and the necessary equipment for the wet work in connection with assaying. Accommodation for twenty-four students at a time is provided, by individual work desks, each supplied with a balance, weights, fluxes, tools, drawers and lockers. Common to both laboratories is the balance room which has a cement table on brick piers to support the bead balances. These are illustrative of the types met in practice. The latest model with a sensitivity of 1/500 milligram, is equipped with multiple weight attachment, and a mechanical pan extractor. Adjoining the West laboratory is a research room. A store-room adjoins the East laboratory where fluxes, clay ware and extra parts are kept. In the instructor's room are stored a large number of ores and bullion, obtained chiefly from typical mining districts and metallurgical plants, for class use. The preparation of ores is done in the Milling building, where crushers, pulverizers and sampling devices are available. A special laboratory sampler has been constructed for the purpose of giving samples for the student's assays, of indisputable similarity, thus confining variations in results to the students' work. Other apparatus includes Guess-Haultain stationary electrolytic outfits, King rotating electrolytic apparatus, microscopes, optical resistance and thermocouple pyrometers, hand and foot cupel machines, grinding plates and screens.

MINING AND ORE DRESSING LABORATORY

A detached building 72 ft. x 70 ft. contains the Mining and Ore dressing equipment. It is heated, lighted and supplied with power from the central plant. It is divided into several parts, the larger being 72 ft x 53 ft. by 22 ft. high.

In this room is a 5-stamp battery with amalgamation plates, Wilfley table, Deister Plat-o table, Deister slime table, buddle, and classifiers of sufficient size to make tests on lots of from one to ten tons.

In addition are a set of small Wilfley tables, two 3-compartment jigs, a 2 ft. x 3 ft. tube mill, a small experimental tube mill, agitators, small classifiers and other testing apparatus for experimenting on the falling rates of ore particles, slime settling, surface tension and flotation processes. These include a Case machine, a K. and K. machine, a Ruth machine, a Callow cell, etc. Water is supplied from a tank in the roof. The machinery is all motor driven.

One portion of the room is devoted to rock drills of various types and other mining apparatus.

The other part of the building, 72 ft. x 17 ft., is divided into several rooms and contains a Hadfield's Gyratory Crusher, 16 in. x 12 in. Rolls, small crushers, screening machine, and sampling apparatus. The crushers are driven by a 30 h.p. motor in another room.

The other rooms contain a Wetherill magnetic separator, screen sets, a smithing equipment, workshop and storage for small lots of ore. The larger part of the ore supply is accommodated in bins outside the building.

The plant throughout is intended mainly for teaching and experimental purposes.

There has recently been added apparatus especially designed for research work in various phases of rock crushing and grinding:—Ball Mills with plate glass ends for the study of ball paths; a small Ball and Rod Mill on ball bearings with dynamometer; a set of high grade miniature Rolls in ball bearings with integrating dynamometer.

METALLURGICAL LABORATORIES

This laboratory, in the East end of the Mining building, occupies about 3,600 sq. ft. on the basement floor and the same space immediately above on the ground floor. The basement floor is divided into one large furnace room, a small hydrometallurgical room and two store-rooms. The furnace room contains a motor driven Connersville blower, several gas fired furnaces, two small blast furnaces, and a small 6 hearth Wedge roasting furnace. The larger electric furnaces of the Department of Electrochemistry are in this room. Some are supplied with direct current, others with A.C. from a 200 K.V.A. transformer. A system of flues, with hoods

over all the furnaces, leads through a Cottrell precipitator of the Rathbun type taking current at 50,000 volts, to a stack through which gases are pulled by a fan in the attic.

The hydro-metallurgical room in addition to apparatus for leaching tests contains several natural draft furnaces, a large Hoskins resistance furnace and a 113 lb. drop hammer. There are also tanks for electrolytic refining and precipitation of metals.

The upper floor is divided into laboratories, store rooms and offices. The laboratories are: 1. Metallurgical analysis; 2. Heating treatment and pyrometry; 3. Grinding, polishing and etching; 4. Metallographic room with an adjoining dark room.

In the laboratory for metallurgical analysis the student is given some training in mill and smelter methods of analysis. It is well equipped for this work.

In the heat treatment and pyrometry laboratory are a number of tube furnaces of different sizes, a Leeds & Northrup transformation point indicator with furnace, double thermocouple and twin galvanometer, a Leeds & Northrup potentiometer pyrometer, a disappearing filament pyrometer, and many thermocouples for use with galvanometer or potentiometer. For grinding and polishing there is provided two motor driven emery wheels and a set of 3 motor driven horizontal polishing plates.

The Metallographic room is equipped with the latest type Bausch & Lomb horizontal inverted microscope type of photo micrographic apparatus, an older and horizontal photo micrographic instrument made by Pellin, Paris; two vertical photo micrographic instruments and three other metallographic microscopes.

There are also a Pellin instrument for the determination of critical points by photography according to the Saladin method and a Leeds & Northrup type "K" precision potentiometer, which is also used for the determination of critical points.

The laboratory has a Rockwell hardness testing machine, and a wire drawing bench.

The Ceramic equipment includes:

A dry pan and a vertical, plug mill.

A small dry press.

A plunger machine with tile and hollow ware dies.

An Abbé six jar ball mill.

A recuperative down draft clay testing furnace of brick construction.

An oil fired muffle decorating kiln.

A small Seger test furnace.

A high temperature oxygen acetylene furnace.

Standard screens, volumeters, elutriation apparatus driers and such sundries as are necessary for clay testing.

MECHANICS OF MATERIALS LABORATORY

This laboratory is available for the scientific and commercial testing of materials of construction such as iron, steel, timber, concrete and masonry.

It is supplied with the following:

An Emery 50-ton hydraulic machine, built by Wm. Sellers & Co., of Philadelphia, for making tests in tension and compression.

A 200 ton, three-screw power testing machine, built by Riehlé Bros., Philadelphia. It will make tests in tension, compression, shear and cross-bending, and will take posts 10 feet long and beams of 16 feet in span.

A Riehlé 100 ton screw power universal testing machine, taking posts 12 feet long and beams of 18 ft. span.

A Riehlé 10-ton screw power universal testing machine.

A Riehlé 50-ton screw power universal testing machine.

A Riehlé standard brick rattler.

A 15-ton single lever-machine, built by J. Buckton & Co., Leeds, England.

A torsion machine, built by Tinius Olsen & Co., Philadelphia, for testing the strength and elasticity of shafting. This machine will twist shafts up to 16 feet in length and 2 inches in diameter.

A hand power torsion machine of simple mechanical construction, specially designed for the testing of short shafts of a maximum diameter of one inch.

A Riehlé transverse testing machine of 5,000 pounds capacity, adapted to specimens up to 48 inches in length.

A Riehlé compressometer, with spherical seat attachment for the adjustment of specimens having slightly non-parallel faces. This compressometer will receive specimens up to 10 inches in length.

An Olsen compression micrometer of standard type.

A 20,000 pound Olsen, hand power, wire testing machine, specially fitted for testing wooden columns with both fixed and pivoted ends.

An Olsen combined tension and cantilever type impact testing machine.

An Olsen, 20,000 pound, hand power testing machine especially adapted for testing long columns.

An Olsen, 200 pound capacity, textile testing machine.

A Berry strain-gauge for spans of 2 inches and 8 inches.

A Nalder dividing engine. This may be used either for the precise division of scales or for the calibration of instruments intended for refined measurements.

A Brinell hardness testing machine.

A Shore scleroscope for testing hardness.

A Fereday-Palmer stress recorder by T. Cooke & Sons, Ltd., London.

Four Beggs deformeter gauges with necessary plugs and accessories for investigating stresses in structures by means of models.

A large number of extensometers of the usual degree of precision. These include the Bauschinger, Martens, Unwin, Ames, Riehlé, Johnson, Henning

(recording) and other types. In addition there are the usual scales, micrometers, telescopes and reflectors, voltmeters for the determination of metallic contact, and such other appliances as are necessary in the making of precise measurements.

The shop is equipped with a number of high-class machine tools specially fitted for reducing the specimens to the requisite shapes and dimensions with a minimum of hand labour. It is also supplied with the necessary appliances for making ordinary repairs and for making apparatus for special experiment and original investigation.

HIGHWAY LABORATORY

ROAD METALS AND SUBGRADE SOILS

This laboratory is equipped for carrying out investigations in the various materials employed in highway construction and maintenance, and comprises the following:

Page impact machine for testing the toughness of road materials.

Diamond core drill for preparing specimens for the toughness test.

Deval abrasion machine for testing the resistance to wear of road materials.

Cementation testing apparatus (Page type) for determining cementing properties of road materials.

Jaw crusher (Mitchell type) for crushing rock for various tests.

Power driven agitator with sieves for the mechanical analysis of sand, gravel and crushed rock.

Dorry hardness testing machine for determining the hardness of rock used in road construction.

Apparatus for determining the moisture equivalent, volumetric changes, capillary moisture, dye absorption and similar properties of subgrade soils.

BITUMENS

This laboratory is designed for the investigation of the physical rather than the chemical properties of bitumens used in road construction and maintenance. The equipment consists of an extractor for separating bitumens and aggregates, an Engler viscosimeter, a penetration apparatus as well as appliances for determining melting point, volatilization, specific gravity, ductility, etc.

LABORATORY OF ONTARIO BOARD OF HEALTH

Through the courtesy of the Secretary of the Provincial Board of Health for Ontario the facilities of the excellently equipped laboratory which the Board maintains at Stanley Park have, with certain conditions, been placed at the service of the University for the investigation of problems of interest to the sanitarian and the sanitary engineer. The equipment consists of various types of sewage sedimentation tank, sewage filter, sewage measuring devices, aerators, sterilizing appliances and a complete and representative plant intended for the filtration and sterilization of water by practically all known methods.

CEMENT TESTING LABORATORY

This laboratory is fitted with all the ordinary moulds, sieves, balances, burettes, steaming and drying tanks, tables, and other appliances necessary in making the usual physical tests of a Portland cement. It is also supplied with completely equipped cabinets for individual work. In addition there are the following:

A 2,000 lb. Riehlé shot machine for tension.

A 2,000 lb. Fairbanks shot machine for tension.

A 1,000 lb. Olsen automatic shot machine fitted for tests in either tension or cross breaking.

An Olsen soapstone moist closet of modern design.

METROLOGICAL LABORATORY

The department of surveying and geodesy is provided with all the ordinary field instruments, such as transits, levels, compasses, micrometers, sextants, planimeters, plane tables, tapes, chains, etc., with which is carried on the instruction in practical field operations as detailed elsewhere.

A small laboratory is also established in the basement of the observatory described below, containing the necessary instruments for the refined measurements of geodetic surveying; as, a standard yard and metre, a Rogers 10-foot comparator, an invar base measuring apparatus, a Kater's pendulum with vacuum chamber, a level trier, micrometer microscopes, etc.

The geodetic observatory in connection with this department is used for the instruction of students of the Fourth Year in taking observations for time, latitude, longitude, and azimuth by the precise methods used in connection with a geodetic survey. It contains a 10-inch theodolite and zenith telescope by Troughton & Simms; an astronomical transit instrument and an 8-inch theodolite by Cooke; two electro-chronographs; a Howard astronomical clock; a Dent sidereal clock; a Dent sidereal break-circuit chronometer; a wireless receiving instrument; arithmometers, etc.

GEOLOGICAL AND MINERALOGICAL LABORATORIES

In the Chemistry and Mining building on College Street the University possesses a modern laboratory for Geology and Mineralogy.

Courses are given in laboratory work, especially in personal examination of type sets of rocks, fossils, minerals and crystal models. These laboratory exercises serve to illustrate the introductory didactic instruction.

For the encouragement of pure crystallography the laboratories are supplied with goniometers of the various types, crystal models, appliances for the cutting of oriented crystal sections and for the physical examination of the same. Practical petrography is carried on in rooms provided with type sets of rocks, both macroscopic and microscopic. Advanced students are taught to make thin sections of rocks and fossils and to study them

microscopically. For students in Mining a laboratory course in the interpretation of geological maps and sections is provided. Typical mining regions are studied in detail and an opportunity is afforded for the examination of specimens illustrating economic geology.

The laboratory for the preparation of thin sections of rocks, minerals and fossils is provided with electric diamond saws and grinding appliances for the various types of work incidental to the preparation of thin sections and museum material.

A room is also provided for advanced work in cartography and geological surveying.

The departments possess 28 petrological microscopes and 5 of other types, so that it is now possible to provide advanced students with instruments and sets of thin sections for their own especial use. The blowpipe laboratory contains 156 lockers, especially designed for apparatus for students. Provision is made for the study of opaque minerals in reflected light.

LIBRARY

The University Library is contained in a building of its own, situated on the east side of the campus, that lies to the south of the Main Building. All students who have paid a library fee to the Bursar of the University are entitled to the privileges of the Library. Besides Reading Rooms the Building contains Departmental Studies, which may be used as study-rooms by honour students in the various branches and in which the Professors hold seminary courses, and private studies, intended for members of the Faculty or advanced students engaged in research work. The Library is opened at 8.45 every morning and remains open until 10 at night during the academic term. Books in ordinary use may not be taken out of the building during the daytime, but are lent for the night towards 5 p.m., to be returned the following morning before 10 o'clock. Books not in general demand may, on special application, be borrowed for a longer period. Failure to return a borrowed book at the proper time and other breaches of the regulations are punishable by fine or suspension from the privileges of the Library.

Rooms have been set apart in the Engineering, Mechanical, Chemistry and Mining and Electrical buildings for the housing of such periodicals and other literature of the University Library as is of special interest to the students of this faculty.

ROYAL ONTARIO MUSEUM

ARCHAEOLOGY, GEOLOGY, MINERALOGY, PALAEONTOLOGY, ZOOLOGY

Students of the University in all departments are recommended to avail themselves of the privileges of the Museum, which, although under separate control, is intimately connected with the work of the University.

The Museum is open on all week days from 10 a.m. to 5 p.m., and on Sundays from 2 p.m. to 5 p.m. The admission is free to the public on Tuesday, Thursday, Saturday and Sunday. On other days an admission fee of fifteen cents is charged.

By a resolution of the Board of Trustees all regular students of the University may be admitted free on all days of the week by presenting their card of registration.

UNIVERSITY OF TORONTO C.O.T.C.

The Toronto Contingent of the Canadian Officers Training Corps was organized in 1914, and is a unit of the non-permanent Active Militia. Its primary object is to provide students at Universities with a standardized measure of military training with a view to their qualifying for commissions in the country's auxiliary forces. C.O.T.C. Certificates of qualification exempt their holders from examination for commissioned rank on joining a militia unit in Canada, or, if resident in the British Islands, render them eligible for commissions in the Army Reserve of Officers, the Militia, or the Territorial Army.

The facilities which are offered by the contingent for obtaining a qualification while at the University, are intended to enable young gentlemen to give personal service to their country with the least possible interference with their civil careers, to ensure that units have their establishments complete in the junior commissioned ranks, and to build up an adequate reserve of scientifically trained officers who have completed a period of consecutive and systematic military training, on academic lines, of a nature calculated to produce good officers.

The contingent provides the practical work for students taking the Military Studies option for the Arts degree, as also physical exercise for students who may choose this as the form in which they will take their compulsory Physical Training. In addition to service in the corps for a University credit, students of any year or Faculty are trained in it to qualify for officers' certificates in the Artillery, Infantry, Engineers, Army Medical Corps and Signallers, writing on the examinations set by the War Office for members of O.T.C. contingents throughout the Empire.

There are at present four companies—in the Faculties of Arts, Medicine and Applied Science—and the training of each is so arranged that on leaving the University students are qualified for commissions in that branch of the Militia to which their University course particularly applied.

The present Headquarters are at 184 College Street, and include armouries, members' reading room, library, and lecture rooms.

The Contingent's Staff is:

Officer Commanding..Lieut.-Col. T. R. Loudon, late Can. Eng., B.E.F.
Second in Command....................Major J. R. Cockburn, M.C.
Adjutant................................Lieut. F. W. Bertram
Paymaster....................................Capt. T. A. Reed
Contingent Sergeant-Major..... S-M. W. Hunt, late Royal Welsh Fusiliers.

Officers of "C" (Applied Science) Company:

Officer Commanding...................Capt. W. J. T. Wright, M.B.E.

SOCIETIES

THE ENGINEERING SOCIETY OF THE UNIVERSITY OF TORONTO

The Society meets every second Wednesday during the academic year (except April), beginning with the second Wednesday in October. Addresses are given by prominent men on subjects of general interest.

The Society is divided into six clubs for the purpose of affording a medium of study of matters relating in particular to different branches of Engineering. Each of the Clubs holds its meetings at regular intervals. Papers are read and discussions held on engineering subjects.

The Society publishes an annual, called "Transactions," which contains the addresses given at the meetings and an account of the year's activities.

A Supply Department is conducted by the Society on a co-operative plan, through which instruments, draughting supplies, stationery, etc., can be purchased at a low cost.

ATHLETIC ASSOCIATION

The Athletic Association has full control over all athletic clubs using the name of the Faculty of Applied Science. The Executive Committee has power to suspend any one from the privileges of membership in the Association for any breach of its regulations, and controls the finances of all athletic clubs in the aforesaid Faculty. The annual membership fee of this Association is two dollars.

No other moneys are collected for the support of athletics in the Faculty of Applied Science without the sanction of the Executive Committee.

DEBATING CLUB

The Debating Club exists for the purpose of helping students to overcome their natural embarrassment when speaking in public and to that end holds weekly meetings during both terms, at which open debates take place after the manner of the Oxford Union.

THE INDUSTRIAL CHEMICAL CLUB

The object of the Chemical Club is to promote the study of industrial chemistry and chemical engineering. Illustrated lectures, preceded by an informal dinner and a short musical programme, are held fortnightly, and on the following day an excursion is made to industrial concerns located in the city or vicinity.

MECHANICAL AND ELECTRICAL ENGINEERING CLUB

The Club meets during the academic year for the discussion of papers relating to mechanical and electrical engineering problems.

CIVIL ENGINEERING CLUB

The Club is addressed during the academic year by practising engineers on modern methods and problems in civil engineering.

MINING AND METALLURGICAL CLUB

The Club is the official organization representing the undergraduates of Departments 2 and 8 of the Faculty of Applied Science.

The objects of the Club are to promote the spirit of good fellowship and mutual assistance amongst its members, both graduate and undergraduate, to provide a means of meeting together, and for the discussion of pertinent topics.

ARCHITECTURAL CLUB

The Architectural Club is addressed during the academic year by Architects and others on the latest works and developments in their profession.

STUDENT CHRISTIAN ASSOCIATION

The Student Christian Association now carries on the work commenced by the Young Men's Christian Association in this Faculty in 1905. The aims of the Association are to develop true Christian manhood and to be of assistance to students. Bible study groups are conducted, conferences arranged and students are given help in finding suitable rooms, etc.

LODGING AND BOARD

Accommodation is readily obtainable in numerous private boarding-houses within convenient distance of the University, at a cost of from twelve dollars a week upwards for comfortable lodging with board; or rooms may be rented at a cost from six dollars a week upwards, and board obtained separately at about seven dollars per week. A list of accredited boarding-houses is kept by the Secretary of the Students' Christian Association, and students are recommended to consult him with reference to the selection of suitable accommodation.

UNIVERSITY RESIDENCES

By the generosity of the late E. C. Whitney, Esq., Mrs. Whitney and friends, the University offers to one hundred and fifty men the advantages of residential life and excellent accommodation within its own grounds. The Residence consists of three Houses situated on the north side of Hoskin Avenue, opening upon a quadrangle, the fourth side of which is formed by Devonshire Place. They stand about two hundred yards to the north of University College and close to Hart House. The buildings are known as the South, East and North Houses.

Each House contains twenty-four single rooms, one single suite, and eleven suites, a suite comprising a study and two bedrooms. Two large rooms in each building each with an open hearth have been set aside as a common rooms. A lavatory, with hot and cold shower baths is provided for every eight men. The buildings are heated by steam and lighted by electricity.

The University supplies the table, chairs, book-case, chiffonier, bed, mattress, pillows, linen and window shades for each room; it is prepared to furnish a desk lamp for a nominal rental.

The rates are $4.00 per week for a single room or half of a suite, and $5.00 per week for a single suite. The rent is payable as follows: For the Michaelmas Term, when the key is issued; for the Easter Term up to April 1st, at the opening of the Easter Term; for the remainder of the Easter Term, April 1st. These charges cover heat, light, house-service and house-laundry. To cover local telephone service each student in residence will be required to pay the Bursar an Annual Fee of $2.00. There is no separate dining hall connected with the Residence, but board may be obtained at the adjacent University Dining Hall in Hart House.

Except under very special circumstances occupants who withdraw at any time during the session will be required to pay the full rent up to April 1st.

Applications for rooms must be made in writing to the Secretary of the Residence Committee (address the Registrar's Office) and must be accompanied by a deposit of $5.00. This deposit will be returned if the applica-

tion be not granted, and will be forfeited if a room is assigned to the applicant and not taken by him, unless notice of his refusal of the room be received by the Secretary in writing before September 15th. It will be returned in full at the end of the College year if the room key be given back and the room and furniture left in a satisfactory condition. The following principles govern the allotment of rooms: (i) No student who, as a result of the annual Spring examinations, is not assured of being able to proceed to a subsequent year, will be admitted into the Residence. Exception to this rule will be made in the case of a student in the Faculty of Medicine who has obtained standing at the May examination, but is debarred by the rules of that Faculty from proceeding to the subsequent year until he has passed his Supplemental examinations. Such a student will be assigned a room provisionally, but cannot occupy it unless he passes his Supplemental examinations in September. (ii) The rooms in each House will be distributed among the various Faculties and Years. (iii) A limited number of rooms will be reserved for members of the incoming First Year until September 12th. (iv) Applications will be considered in order of priority.

The University lays down three general rules, designed to prevent hazing, the use of intoxicants and gambling. The students in each House shall elect a House Committee, which is entrusted by the University with the making and enforcing of any other needed rules and with the maintenance of order. A member of the Faculty resides in each House to act as friend and adviser to the men in residence.

SUMMARY OF STUDENTS REGISTERED

SESSION 1926-1927

	Department							
Year	1	2	3	4	6	7	8	Total
I	19	18	22	9	39	50	6	163
II	18	8	23	12	20	23	6	110
III	17	10	23	6	18	33	3	110
IV	18	5	20	8	18	34	1	104
	72	41	88	35	95	140	16	487

UNIVERSITY OF TORONTO

CALENDAR OF THE FACULTY

OF

APPLIED SCIENCE AND ENGINEERING

1928-1929

THE UNIVERSITY OF TORONTO PRESS

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JANUARY

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	31
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

FEBRUARY

Sun.		5	12	19	26
Mon.		6	13	20	27
Tues.		7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	..
Fri.	3	10	17	24	..
Sat.	4	11	18	25	..

MARCH

Sun.		4	11	18	25
Mon.		5	12	19	26
Tues.		6	13	20	27
Wed.		7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	31

APRIL

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	..
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

MAY

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	31
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

JUNE

Sun.		3	10	17	24	..
Mon.		4	11	18	25	..
Tues.		5	12	19	26	..
Wed.		6	13	20	27	..
Thur.		7	14	21	28	..
Fri.	1	8	15	22	29	..
Sat.	2	9	16	23	30	..

JULY

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	31
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

AUGUST

Sun.		5	12	19	26
Mon.		6	13	20	27
Tues.		7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	31
Sat.	4	11	18	25	..

SEPTEMBER

Sun.		2	9	16	23	30
Mon.		3	10	17	24	..
Tues.		4	11	18	25	..
Wed.		5	12	19	26	..
Thur.		6	13	20	27	..
Fri.		7	14	21	28	..
Sat.	1	8	15	22	29	..

OCTOBER

Sun.		7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	31
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

NOVEMBER

Sun.		4	11	18	25
Mon.		5	12	19	26
Tues.		6	13	20	27
Wed.		7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	..

DECEMBER

Sun.		2	9	16	23	30
Mon.		3	10	17	24	31
Tues.		4	11	18	25	..
Wed.		5	12	19	26	..
Thur.		6	13	20	27	..
Fri.		7	14	21	28	..
Sat.	1	8	15	22	29	..

1929 CALENDAR 1929

JANUARY

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	31
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

FEBRUARY

Sun.		3	10	17	24
Mon.		4	11	18	25
Tues.		5	12	19	26
Wed.		6	13	20	27
Thur.		7	14	21	28
Fri.	1	8	15	22	..
Sat.	2	9	16	23	..

MARCH

Sun.		3	10	17	24	31
Mon.		4	11	18	25	..
Tues.		5	12	19	26	..
Wed.		6	13	20	27	..
Thur.		7	14	21	28	..
Fri.	1	8	15	22	29	..
Sat.	2	9	16	23	30	..

APRIL

Sun.		7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	..
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

MAY

Sun.		5	12	19	26
Mon.		6	13	20	27
Tues.		7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	31
Sat.	4	11	18	25	..

JUNE

Sun.		2	9	16	23	30
Mon.		3	10	17	24	..
Tues.		4	11	18	25	..
Wed.		5	12	19	26	..
Thur.		6	13	20	27	..
Fri.		7	14	21	28	..
Sat.	1	8	15	22	29	..

JULY

Sun.		7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	31
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

AUGUST

Sun.		4	11	18	25
Mon.		5	12	19	26
Tues.		6	13	20	27
Wed.		7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	31

SEPTEMBER

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	..
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

OCTOBER

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	31
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

NOVEMBER

Sun.		3	10	17	24
Mon.		4	11	18	25
Tues.		5	12	19	26
Wed.		6	13	20	27
Thur.		7	14	21	28
Fri.	1	8	15	22	29
Sat.	2	9	16	23	30

DECEMBER

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	31
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

CALENDAR OF THE FACULTY OF APPLIED SCIENCE AND ENGINEERING 1928-29

Michaelmas Term

1928—July 2	Monday.....	Dominion Day. University Buildings closed.
Aug. 16	Thursday....	Students, third year, Dept. 1, report at Summer Survey Camp.
Aug. 23	Thursday....	Students, third year, Dept. 2, report at Summer Survey Camp.
Sept. 1	Saturday....	Last day for receiving applications for Supplemental Examinations.
Sept. 3	Monday.....	Labour Day. University Buildings closed.
Sept. 8	Saturday....	Students fourth year, Astronomy Option, report at Summer Survey Camp.
Sept. 19	Wednesday..	Supplemental examinations commence.
Sept. 24	Monday.....	Registration in person of the first year, from 9.00 a.m. to 5.00 p.m.
Sept. 25	Tuesday.....	Registration in person of the second, third and fourth years, from 9.00 a.m. to 5.00 p.m.
		Preliminary instruction to first year.
		The Dean's address to the first year at 9.30 a.m. in the first year draughting room.
		Classification tests in first year.
		Meeting of Faculty Council.
Sept. 26	Wednesday..	The opening address by the President to the students of all Faculties at 3.00 p.m. in Convocation Hall.
		Lectures and Laboratory work commence at 8.00 a.m.
Oct. 5	Friday......	Inaugural meeting of Faculty Council.
Oct. 6	Saturday....	Stated meeting of the Caput to deal with requests as to social functions until November 15.
Oct. 10	Wednesday..	Interfaculty Track Meet. Neither lectures, nor laboratory classes given after 1.00 p.m
Oct. 12	Friday......	Meeting of Senate.
Oct. 19	Friday......	Meeting of Faculty Council. (Reports of Committees.)
Oct. 22	Monday.....	First meeting of Engineering Society.
Nov. 2	Friday......	Meeting of Faculty Council.
Nov. 5	Monday.....	Meeting of Engineering Society.
Nov. 9	Friday......	Meeting of Senate.

1928—Nov. 10-12	Saturday-Monday..	Thanksgiving. Neither lectures nor laboratory classes given.
Nov. 11	Sunday.....	Armistice Day.
Nov. 19	Monday.....	Meeting of Engineering Society. Change of Time-table.
Dec. 1	Saturday....	Last day for receiving applications for Supplemental examinations.
Dec. 3	Monday.....	Meeting of Engineering Society.
Dec. 7	Friday......	Meeting of Faculty Council.
Dec. 14	Friday......	Meeting of Senate.
Dec. 17	Monday.....	Meeting of Engineering Society.
Dec. 20	Thursday....	Last day of lectures. Term ends at 1.00 p.m.
Dec. 25	Tuesday.....	University Buildings closed.

Easter Term

1929—Jan. 1	Tuesday.....	University Buildings closed.
Jan. 3	Thursday....	Mid-session examinations commence. Easter Term begins. Lectures and laboratory work commence at 9.00 a.m.
Jan. 4	Friday......	Meeting of Faculty Council.
Jan. 11	Friday......	Meeting of Senate.
Jan. 14	Monday.....	Meeting of Engineering Society.
Jan. 18	Friday......	Meeting of Faculty Council. (Examination results.)
Jan. 28	Monday.....	Meeting of Engineering Society.
Feb. 1	Friday......	Meeting of Faculty Council.
Feb. 8	Friday......	Meeting of Senate.
Feb. 11	Monday.....	Meeting of Engineering Society.
Feb. 25	Monday.....	Meeting of Engineering Society.
Mar. 1	Friday......	Meeting of Faculty Council. Last day for receiving applications for Supplemental examinations.
Mar. 6	Wednesday..	Meeting of Engineering Society.
Mar. 8	Friday......	Meeting of Senate. Annual Elections, Engineering Society.
Mar. 18	Monday.....	Annual General Meeting, Engineering Society.
Mar. 29-Apr. 1	Friday-Monday..	Easter. Neither lectures nor laboratory classes given.
Apr. 5	Friday......	Meeting of Faculty Council. Meeting of Senate.
Apr. 6	Saturday....	Easter Term ends. Lectures and laboratory work end at 12.00 noon.
Apr. 12	Friday......	Annual examinations commence.
May 3	Friday......	Meeting of Faculty Council.

1929—May 10 Friday......Meeting of Senate.
May 24 Friday......Victoria Day. University Buildings closed.
June 5 Wednesday..Meeting of Senate.
June 6-7 Thursday-Friday..University Commencement.

UNIVERSITY OF TORONTO

ADMINISTRATIVE OFFICERS OF THE UNIVERSITY

THE UNIVERSITY

President..................Sir R. A. Falconer, K.C.M.G., D.Litt., LL.D., D.D., D.C.L., Oxon.
Registrar..............................J. Brebner, B.A., LL.D.
Bursar..............................F. A. Mouré, Mus. Doc.
Librarian..............................W. S. Wallace, M.A.
Superintendent of Buildings and Grounds........A. D'O. Le Pan, B.A.Sc.
Director of Extension Work and Publicity...........W. J. Dunlop, B.A.
Warden of Hart House......................J. B. Bickersteth, M.A.
Director of University Health Service...............G. D. Porter, M.B.
Medical Adviser for Women Students..Miss E. Gordon, B.A., M.B., D.P.H.
Manager of the University of Toronto Press.........R. J. Hamilton, B.A.

FACULTY OF APPLIED SCIENCE AND ENGINEERING

President............................Sir R. A. Falconer, K.C.M.G.
Dean of Faculty....C. H. Mitchell, C.B., C.M.G., C.E., LL.D., D.Eng.
Secretary of Faculty.................W. S. Wilson, B.A.Sc., A.M.E.I.C.

E. A. Allcut, M.Sc. (Birmingham), M.I.Mech.E. — 50 St. George St. 5
Associate Professor of Mechanical Engineering.

G. R. Anderson, M.A. (Tor. & Harvard), M.I.E.S. — 7 Rose Park Cresc. 5
Professor of Engineering Physics and Photography.

R. W. Angus, B.A.Sc., M.A.S.M.E. — Mechanical Building 5
Professor of Mechanical Engineering.

E. G. R. Ardagh, B.A.Sc., F.C.I.C. — 80 Strathallan Blvd., 12
Associate Professor of Chemical Engineering.

E. R. Arthur, B.Arch., M.A. (Liverpool), A.R.I.B.A. — 158 Albany Ave. 4
Associate Professor of Architecture.

J. W. Bain, B.A.Sc., F.I.C. — 393 Brunswick Ave. 4
Professor of Chemical Engineering.

E. W. Banting, B.A.Sc. — 101 Farnham Ave. 5
Assistant Professor of Surveying.

M. C. Boswell, B.A.Sc., M.A. (Tor. & Harv.), Ph.D. — Mining Bldg. 5
Professor of Organic Chemistry (in Chemical Engineering).

J. R. Cockburn, M.C., B.A.Sc., M.E.I.C. — 100 Walmer Rd. 4
Professor of Descriptive Geometry.

S. R. CRERAR, B.A.Sc., D.L.S. 122 Grenadier Rd. 3
Associate Professor of Surveying.

F. C. DYER, B.A.Sc., M.E.I.C. 233 Ashworth Ave. 4
Associate Professor of Mining Engineering.

P. GILLESPIE, B.A.Sc., M.Sc. (McGill), C.E., M.E.I.C. 358 Davenport Rd. 5
Professor of Civil Engineering.

G. A. GUESS, M.A. (Queen's) Oakville, Ont.
Professor of Metallurgical Engineering.

W. S. GUEST, B.A.Sc. 30 McMaster Ave. 5
Assistant Professor of Electrical Engineering.

H. E. T. HAULTAIN, C.E., M.E.I.C. 156 Glencairn Ave. 12
Professor of Mining Engineering.

J. T. KING, B.A.Sc. 126 Manor Rd. E. 12
Associate Professor of Mining Engineering.

A. T. LAING, B.A.Sc. 146 Balmoral Ave. 5
Associate Professor of Highway Engineering.

T. R. LOUDON, B.A.Sc., M.E.I.C. 189 Sheldrake Blvd. 12
Professor of Applied Mechanics.

H. H. MADILL, B.A.Sc., M.R.A.I.C. 1344 Mount Pleasant Rd. 12
Associate Professor of Architecture.

J. W. MELSON, B.A.Sc. 69 Walmsley Blvd. 5
Assistant Professor of Surveying.

R. J. MONTGOMERY, Cer.E. (Ohio). 46 Atlas Ave. 10
Assistant Professor of Ceramics.

J. A. NEWCOMBE, B.Sc. (London), A.R.S.M. 5 Bloomfield Ave. 8
Assistant Professor of Metallurgy.

J. H. PARKIN, M.E., F.R.Ae.S. 12 Hudson Drive, 5
Associate Professor of Mechanical Engineering.

H. W. PRICE, B.A.Sc. 474 Palmerston Blvd. 4
Professor of Electrical Engineering.

T. R. ROSEBRUGH, M.A. 92 Walmer Rd. 4
Professor of Electrical Engineering.

W. J. SMITHER, B.A.Sc., M.E.I.C. 74 St George St. 5
Associate Professor of Structural Engineering.

L. B. STEWART, D.T.S. 38 St. Germain Ave., 12
Professor of Surveying and Geodesy.

R. TAYLOR, B.A.Sc. 4 Burnside Dr., 10
Assistant Professor of Mechanical Engineering.

J. E. TOOMER, B.S. (North Carolina State). Mining Building. 4
Assistant Professor of Metallurgy.

W. M. TREADGOLD, B.A. 13 Woodlawn Ave. E. 5
Associate Professor of Surveying.

C. H. C. WRIGHT, B.A.Sc., M.R.A.I.C. 419 Markham St. 4
Professor of Architecture.

W. J. T. WRIGHT, M.B.E., B.A.Sc. 126 Melrose Ave. 12
Assistant Professor of Engineering Drawing.
C. R. YOUNG, C.E., M.E.I.C. 98 Hilton Ave. 10
Professor of Structural Engineering.
A. R. ZIMMER, B.A.Sc. 80 Pine Crest Rd. 9
Assistant Professor of Electrical Engineering.

SESSIONAL APPOINTMENTS

C. A. V. ARMOUR, B.A.Sc. 11 Spencer Ave. 3
Demonstrator in Hydraulics.
R. W. BEATTIE, M.Sc., Qu. 211 Robert St. 4
Demonstrator in Chemical Engineering.
K. H. BRAITHWAITE, B.A. West., B.A.Sc. 362 Huron St. 4
Demonstrator in Electrical Engineering.
R. J. BROWN, B.A.Sc. 21 Glen Gordon Rd. 9
Instructor in Electrical Engineering.
A. R. CLUTE, B.A., LL.B. 47 Elgin Ave. 5
Special Lecturer in Limited Companies and Commercial Law.
F. COATES, A.R.C.A. Scarboro Bluffs P.O.
Instructor in Modelling.
J. H. CONNERY, B.A.Sc. 754 Crawford St. 4
Demonstrator in Engineering Drawing.
T. L. CROSSLEY 28 Lonsdale Rd. 5
Special Lecturer in Pulp and Paper.
G. L. DELAPLANTE, B.A.Sc. 307 Delaware Ave. 4
Demonstrator in Thermodynamics.
A. V. DELAPORTE, B.A.Sc. 5 Millerson Ave. 10
Instructor in Sanitary Chemistry.
H. M. DILWORTH, M.A.Sc., M.A. 259 Howland Ave. 4
Demonstrator in Chemical Engineering.
W. B. DUNBAR, B.A.Sc., A.M.E.I.C. 241 Glebeholme Blvd. 6
Lecturer in Engineering Drawing.
H. B. DUNNINGTON-GRUBB, B.S.A. (Cornell) 4 St. Thomas St. 5
Special Lecturer in Landscape Architecture.
G. R. EDWARDS, B.A.Sc. 1263 King St. W. 3
Demonstrator in Engineering Drawing.
W. F. ELLIOT, B.A.Sc. 136 Rosedale Heights Drive. 5
Demonstrator in Engineering Drawing.
W. S. FERGUSON 28 Kilbarry Rd. 5
Special Lecturer in Accountancy and Business.
J. S. FORD, B.A.Sc. 34 Coolmine Rd. 3
Demonstrator in Electrical Engineering.
J. H. FOX, B.A.Sc. 37 Macdonell Ave. 3
Demonstrator in Hydraulics.

J. H. FRASER, B.A.Sc. 327 Huron St. 5
Demonstrator in Mining Engineering.
W. H. GREAVES, M.A. (Bost.) Victoria Coll. 5
Special Lecturer in Public Speaking.
G. H. HARLOW, B.A.Sc. 123 Braemore Gardens 10
Instructor in Mechanical Engineering.
K. B. JACKSON, B.A.Sc. 365 Hillsdale Ave., E. 12
Lecturer in Engineering Physics and Photography.
C. W. JEFFERYS, R.C.A., O.S.A. York Mills
Instructor in Painting.
P. V. JERMYN, B.A.Sc., M.E.I.C. 109 Collier St. 5
Instructor in Engineering Drawing.
R. E. LAIDLAW, B.A.Sc. 77 Glendonwynne Rd. 9
Special Lecturer in Engineering Law.
MISS J. C. LAING, B.A. 221A St. Clair Ave. W. 5
Instructor in History and Librarian in Dept. of Architecture.
A. S. MATHERS, B.A.Sc. 474 Avenue Rd. 5
Special Instructor in Architecture.
H. L. MCCLELLAND, B.A.Sc. Cooksville
Demonstrator in Mining Engineering.
F. H. MCCOLL, B.A.Sc. 68 Gloucester St. 5
Demonstrator in Electrical Engineering.
R. J. MCGRATH, B.A.Sc. 58 Triller Ave. 3
Demonstrator in Applied Mechanics.
W. G. MCINTOSH, B.A.Sc. 360 Rosewell Ave. 12
Lecturer in Machine Design.
C. A. MORRISON, B.A.Sc. 164 Indian Road Cres. 9
Demonstrator in Engineering Physics and Photography.
D. D. MOSSMAN, B.Sc. (McGill) M.A. 29 Isabella St. 5
Demonstrator in Chemical Engineering.
G. L. B. ROBERTS, B.A.Sc. East House, Knox College 5
Demonstrator in Electrical Engineering.
R. M. ROBERTSON, B.A.Sc. 53 Castle Frank Rd. 5
Demonstrator in Engineering Drawing.
W. L. SAGAR, B.A.Sc., A.M.E.I.C. 306 Jarvis St. 2
Instructor in Applied Mechanics.
C. J. SALTER, B.A.Sc. 289 Carlton St. 2
Demonstrator in Engineering Drawing.
H. E. SAUNDERS, B.A.Sc. 489 Willard Ave. 9
Demonstrator in Thermodynamics.
F. E. SIMPSON. 14 Lakeview Ave. 3
Assistant in Modelling.
E. A. SMITH, M.A. 216 Sheldrake Blvd. 12
Lecturer in Chemical Engineering.
V. G. SMITH, 75 Fulton Ave. 6
Lecturer in Electrical Engineering.

C. I. SOUCY, B.A.Sc. — 48 Moore Ave. 5
Lecturer in Electrical Engineering.

J. J. SPENCE, A.M.E.I.C. — 63 Stibbard Ave. 12
Instructor in Engineering Drawing.

P. G. STANLEY, B.A.Sc. — 212 St. Clair Ave. W. 5
Demonstrator in Machine Design.

A. S. TOWNSHEND, M.Sc. (Queen's), M.A. — 225 Robert St. 4
Demonstrator in Chemical Engineering.

F. R. WHATMOUGH, B.A.Sc. — 1341 Lansdowne Ave. 10
Demonstrator in Electrical Engineering.

A. C. WILSON, B.A.Sc. — 283 Evelyn Ave. 9
Instructor in Engineering Drawing.

R. W. WELLAND, B.A.Sc. — 327 Huron St. 5
Demonstrator in Mining Engineering.

G. R. WORKMAN. — 22 Helena Ave. 10
Demonstrator in Engineering Drawing.

MEMBERS OF OTHER FACULTIES GIVING INSTRUCTION TO STUDENTS IN APPLIED SCIENCE

S. Beatty, M.A., Ph.D., 537 Markham St. 4
Professor of Mathematics.

M. A. Buchanan, B.A., Ph.D., 75 Heathdale Road 10
Professor of Italian and Spanish.

J. T. Burt-Gerrans, Phm.B., M.A., Ph.D. 46 Dewson St. 4
Associate Professor of Electrochemistry.

A. T. DeLury, M.A., 74 St. Albans St. 5
Professor of Mathematics.

G. H. Duff, M.A., Ph.D., 325 Kendal Ave. 10
Assistant Professor of Plant Physiology.

B. Fairley, M.A., Ph.D., 197 Dawlish Ave. 12
Associate Professor of German.

C. R. Fay, M.A., D.Sc., 374 Brunswick Ave. 4
Professor of Economic History.

J. B. Ferguson, B.A. 511 Christie St. 10
Associate Professor of Chemistry.

J. G. Fitzgerald, M.D., 186 Balmoral Ave. 5
Professor of Hygiene and Preventive Medicine.

D. T. Fraser, M.B., D.P.H., 190½ Lowther Ave. 4
Assistant Professor of Hygiene and Preventive Medicine.

T. Hedman, Ph.B., Old Forest Hill Road
Assistant Professor of German.

G. E. Holt, M.A., Mus.Bac., 20 Nanton Ave. 5
Assistant Professor of German.

F. C. A. Jeanneret, B.A., 70 St. Alban's St. 5
Professor of French.

F. B. Kenrick, M.A., Ph.D., 77 Lonsdale Road 5
Professor of Chemistry.

W. J. Loudon, B.A., 9 Woodlawn Ave. E. 5
Professor of Mechanics.

J. W. MacArthur, M.A., Ph.D., 319 Roehampton Ave. 12
Assistant Professor of Genetics.

M. A. Mackenzie, M.A., F.I.A., 1 Bellwoods Park 3
Professor of Mathematics.

A. MacLean, B.A., 60 St. George St. 5
Associate Professor of Geology.

W. L. Miller, B.A., Ph.D., 8 Hawthorne Ave. 5
Professor of Physical Chemistry.

E. S. Moore, M.A., Ph.D., 53 Hewitt Ave. 3
Professor of Economic Geology.

G. H. NEEDLER, B.A., Ph.D., *Professor of German.*	103 Bedford Road 5
W. A. PARKS, B.A., Ph.D., *Professor of Geology.*	60 Albany Ave. 4
A. L. PARSONS, B.A., *Associate Professor of Mineralogy.*	79 Oriole Road 5
I. R. POUNDER, M.A., Ph.D., *Associate Professor of Mathematics.*	19 Glen Gordon Rd. 9
L. J. ROGERS, B.A.Sc., M.A., *Associate Professor of Chemistry.*	110 Garfield Ave. 5
H. B. SPEAKMAN, M.Sc., *Associate Professor of Zymology.*	61 Walmsley Blvd. 5
T. L. WALKER, M.A., Ph.D., *Professor of Mineralogy and Petrography.*	20 Avondale Ave. 5
R. K. YOUNG, B.A., Ph.D. *Associate Professor of Astronomy.*	96 Isabella St. 5

SESSIONAL APPOINTMENTS

F. M. ARCHIBALD, B.Sc. (McGill) *Assistant in Electrochemistry.*	North House, U. of T. 5
MISS E. V. EASTCOTT, M.A., Ph.D. *Assistant in Chemistry.*	84 Queen's Park. 5
W. E. GRAHAM, M.A. *Assistant in Electrochemistry.*	126 Lennox St. 4
H. W. HILBORN, B.A. *Lecturer in Italian and Spanish.*	37 Charles St. W. 5
W. A. IRVINE, B.A.Sc. *Assistant in Electrochemistry.*	315 Willard Ave. 3
MRS. M. M. JOHNSTON, M.A. *Demonstrator in Hygiene.*	Apt. 11, 43 Hillsboro Ave. 5
I. W. JONES, B.A., B.Sc., (Alb.) *Class Assistant in Geology.*	76 St. Mary St. 5
J. M. KANE, B.Sc., Pitt. *Assistant in Chemistry.*	85 Baldwin St. 2
D. E. KERR-LAWSON, B.A., *Demonstrator in Mineralogy.*	99 Bedford Rd. 5
MISS J. C. LAING, B.A. *Instructor in History and French.*	221A St. Clair Ave W. 5
L. L. PERKIN, M.A. *Assistant in Chemistry.*	128 Withrow Ave. 6
M. POIRIER, L. ÈS L., Dip. d'Et. Sup. *Lecturer in French.*	69 Breadalbane St. 5
D. A. F. ROBINSON, M.A. *Lecturer in Mathematics.*	263 St. Clements Ave. 12

E. H. SMITH, B.A. 95 Chudleigh Ave. 12
Assistant in Chemistry.
F. J. SUGDEN, B.A. 134 Soudan Ave. 12
Class Assistant in Geology.
MISS H. M. WICKWARE, B.A. 40 Bedford Rd. 5
Lecturer in Spanish and Italian.

FACULTY OF APPLIED SCIENCE AND ENGINEERING

Historical Sketch

The Legislative Assembly of the Province of Ontario during the Session of 1877 gave its sanction to the establishment of a School of Practical Science on the basis proposed in the memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council on the 3rd day of February, 1877.

By the scheme thus approved the Government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the department of science, above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction of the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor on the 30th day of October, 1889.

By an Order-in-Council, approved by the Lieutenant-Governor on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School. By the terms of this order the management and discipline of the School was vested in the Council.

On December 14th, 1900, the Senate by Statute, subsequently approved by the Lieutenant-Governor in Council, established a Faculty of Applied Science and Engineering but without assuming any liability for its support or maintenance. Under this Statute the teaching Staff and Examiners of the School of Practical Science became the teaching Staff and Examiners of the Faculty, although the University retained the right to appoint the Examiners for the Bachelor of Applied Science and professional degrees. By the University Act of 1906 the School of Practical Science became the Faculty of Applied Science and Engineering of the University of Toronto.

On April 8th, 1892, the Senate of the University established the Degree of B.A.Sc., which was open to those who held the Diploma of the School and were prepared to devote a fourth year to advanced work. In the Session 1909-1910 a new Course extending over four years and leading to the Degree of B.A.Sc. came into operation, taking the place of the long established Diploma Course of three years, which came to an end in the Session 1910-1911.

MATRICULATION

A candidate for admission to the First Year in the Faculty of Applied Science and Engineering must produce satisfactory certificates of good character and of having completed the seventeenth year of his age on or before the first of October of the year in which he proposes to register.

He must also present certificates giving him credit in the following subjects of Pass and Honour Matriculation:

PASS MATRICULATION

ENGLISH (Literature and Composition)
HISTORY (Canadian and Ancient) *or*
CANADIAN HISTORY and MUSIC
MATHEMATICS (Algebra and Geometry)
Any three of:
LATIN (Authors and Composition)
GREEK (Authors and Composition)
FRENCH (Authors and Composition)
GERMAN (Authors and Composition)
SPANISH (Authors and Composition) *or*
ITALIAN (Authors and Composition)
EXPERIMENTAL SCIENCE (Physics and Chemistry) *or*
AGRICULTURE (Parts I and II)
*ARITHMETIC *and* Certificates in MECHANICAL DRAWING and SHOP WORK from the Principal of the School, accompanied by an approving certificate from the Director of the Technical School Branch of the Department of Education for Ontario.

HONOUR MATRICULATION

(At least 50%)

ENGLISH (Literature and Composition).
MATHEMATICS (Algebra, Geometry and Trigonometry).
**PHYSICS
One of:
LATIN (Authors and Composition).
GREEK (Authors and Composition).
FRENCH (Authors and Composition).
GERMAN (Authors and Composition).
SPANISH (Authors and Composition).
ITALIAN (Authors and Composition).

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*This option applies to students—and to such students only—who have been in attendance at and matriculate from a Technical School in the Province of Ontario and certified as such by the Department of Education of the Province.

**Takes effect for Matriculation in 1929.

In selecting the options it is recommended that students take French, German and Experimental Science. In the Department of Architecture, French is recommended; in the Departments of Chemical Engineering and Mechanical Engineering it is desirable that students take German. For students intending to take Metallurgical Engineering, Spanish and Experimental Science are recommended.

The regulations respecting Matriculation, together with a schedule of examinations which may be accepted as equivalent, may be found in the Curriculum for Matriculation on application to the Registrar of the University.

A candidate from the British Isles must present a certificate showing that he has passed or has exemption from the Preliminary Examination of the Institution of Civil Engineers.

ADMISSION

Applications for admission must be made in duplicate on blank forms supplied by the Registrar, and should be forwarded as early as possible to the Registrar of the University, together with all Pass and Honour Matriculation or equivalent certificates.

By order of the Board of Governors, every candidate for admission must submit a certificate of successful vaccination with his or her application, or agree to submit such certificate within ten days after the opening of the session. Dr. Porter and Dr. Edith Gordon of the University Health Services will arrange for the vaccination of those who so desire.

Applications based upon certificates other than those mentioned will be considered as occasion may require. Such certificates must be accompanied by an official statement of the marks in the various subjects upon which the certificate was granted.

ADMISSION *AD EUNDEM STATUM*

An undergraduate of another University may be admitted *ad eundem statum* on such conditions as the Senate on the recommendation of the Council of the Faculty may prescribe.

An applicant for admission *ad eundem statum* must submit with his petition (1) a calendar of his University giving a full statement of the courses of instruction; (2) an official certificate of character and academic standing.

REGISTRATION

Students in any year will be required to register in person on the date specified in the Calendar for the registration of students in that year. Those who present themselves on subsequent days must petition the Council to be allowed to register. Every petition for registration subsequent to the said date must be accompanied by a sum of money reckoned at one dollar per diem for each day thereafter. For sufficient cause the whole or part of such a sum may be refunded.

Council reserves the right to reject applications of, or impose penalties upon, those who fail to report on the dates specified. It is important that students should be in attendance in the laboratories and at lectures from the date of registration.

ENQUIRIES

Enquiries with reference to requirements of admission to the Faculty of Applied Science and Engineering are to be addressed to the Registrar of the University.

Communications relating to curricula, instruction, examinations and standing therein, in the Faculty of Applied Science and Engineering are to be addressed to the Secretary of the Faculty.

DEGREES

Degree of Bachelor of Applied Science (B.A.Sc.)
Degree of Bachelor of Architecture (B.Arch.)

There are six graduating Departments leading to the Degree of Bachelor of Applied Science (B.A.Sc.) and one graduating Department leading to the Degree of Bachelor of Architecture (B.Arch.), viz.,

1. Civil Engineering.
2. Mining Engineering.
3. Mechanical Engineering.
4. Architecture.
5. (Discontinued.)
6. Chemical Engineering.
7. Electrical Engineering.
8. Metallurgical Engineering.

Prescription of the courses in these Graduating Departments are given on pages 44, 49, 52, 56, 5, 59, 62 and 65.

In the fourth year, optional courses are arranged in certain departments. Students are required to submit their selection to the Secretary in writing, not later than September 15th. The proposed selection must be approved by Council before adoption.

Degree of Master of Applied Science (M.A.Sc.)
Degree of Master of Architecture (M.Arch.)

Graduates holding the Degree of B.A.Sc. of this University or those holding the degree of another University recognized as equivalent, may take post-graduate work proceeding to the Degree of Master of Applied Science (M.A.Sc.). (For requirements, see page 116.)

Graduates holding the Degree of B.Arch. or B.A.Sc. in Architecture of this University, or those holding the Degree of another University recognized as equivalent, may take post-graduate work proceeding to the Degree of Master of Architecture (M.Arch.). (For requirements, see p. 116.)

Professional Degrees

Graduates in Applied Science and Engineering, graduates of the School of Practical Science and any others who, having graduated in Engineering from another institution of recognized reputation, have spent not less than two years as members of the teaching staff in this Faculty, may, after three years spent in professional work, present themselves for the degrees of Civil Engineer (C.E.), Mining Engineer (M.E.), Mechanical Engineer (M.E.), Electrical Engineer (E.E.), Chemical Engineer (Chem.E.), Metallurgical Engineer (Met.E.), as the case may be, subject to the rules and regulations established by the University.

FEES

All fees are payable at the Bursar's office between the hours 10 a.m. and 1 p.m. of each week day except Saturday (or may be remitted by mail).

The annual fees, including tuition, library, laboratory supplies and one annual examination for each year, shall be as follows:

If paid in full on or before November 5th	$200.00
If paid by instalments.—	
First instalment, if paid on or before November 5th	100.00
Second instalment, if paid on or before February 5th	103.00

Repeating a year—The fees shall be the same as the foregoing.

The above fees are payable in advance. After November 5th a penalty of $1.00 per month will be imposed until the whole amount is paid. In the case of payment by instalments the same rule as to penalty will apply.

Students must have paid the fees due in the first term before proceeding to the work of the second term.

General Fees

Matriculation, or registration of Matriculation	$ 5.00
Supplemental examination	10.00
Admission *ad eundem statum*	10.00
Degree of B.A.Sc. (Payable Apr. 1st)	10.00
Degree of B. Arch. (Payable Apr. 1st)	10.00
Physical Training (see page 24)	5.00
Supplemental Physical Training (see page 24)	10.00
Hart House (see below)	10.00
Students' Administrative Council (see page 24)	4.00

Dues and Deposits

All dues and deposits are payable at the office of the Faculty at the time of Registration. Cheques must be made out in favour of "Faculty of Applied Science and Engineering".

Engineering Society membership	$2.00
Athletic Association membership	2.00
Annual deposit, Departments 1, 3, 4, 7	3.00
Departments 2, 6, 8	8.00

Charges for waste, neglect and breakage are to be met out of the deposit fee, the balance of which will be refunded to the student at the end of the session on application to the Secretary.

If the foregoing deposits do not cover the cost of breakage due to carelessness or neglect, the balance shall be paid by the student to the Secretary.

HART HOUSE FEE

Every male student in attendance, proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering, is required to pay to the Bursar before December 1st the annual fee of ten dollars for the maintenance of Hart House. If this fee is not paid by the above date a penalty of two dollars will be imposed, making the total fee twelve dollars.

STUDENTS' ADMINISTRATIVE COUNCIL FEE

Every student in attendance, proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering, is required to pay to the Bursar at the time of the entry of his name with the Secretary the annual fee of four dollars for the support of the Students' Administrative Council.

PHYSICAL TRAINING FEE

Every male student in attendance proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering is required to pay to the Bursar the annual Physical Training fee of $5.00 at the opening of each session in which Physical Training is compulsory for that student.

A student who has failed to complete satisfactorily the course in Physical Training prescribed for the First Year will not be permitted to register in the Third Year; and the student who has failed to complete satisfactorily the course in Physical Training prescribed for the Second Year will not be permitted to register in the Fourth Year.

Every student who has neglected to complete satisfactorily the course in Physical Training of the First or Second Year, and who must take this work during the Second or Third Year respectively of his course, will be required to pay to the Bursar at the opening of the session a Supplemental Fee of $10.00, in addition to the prescribed Physical Training fee.

SCHOLARSHIPS AND PRIZES

Through the generosity of friends of the University, encouragement has been given to both undergraduate and graduate work in the various branches, by establishing the following scholarships and prizes:

Name of Scholarship	Years Eligible	Amount	Described on page
Mrs. M. W. Baptie	I	$100	25
Harvey Aggett Memorial	II	$ 75	26
Boiler Inspection & Insurance Co.	III	$150	26
Jenkins Brothers, Limited	III	$100	26
B.A.A.S. Medal	IV	....	26
Toronto Architectural Guild Medal	IV	....	26
Ontario Association of Architects Scholarship	II	$100	27
Darling and Pearson Prize	V	$100	27
Mathers and Haldenby Prize	III	$25	27
Toronto Brick Company Prizes	III	$75 & $25	27
C. J. Rhodes	II, III, IV	£300	27
Khaki University & Y.M.C.A.	II, III, IV	Loans	29
Jardine Memorial	All	$100	29
S. Ubukata	All	....	29
F. W. Jarvis Bursaries	All	$50	30
U. of T. War Memorial	All	$250	30
Æneas McCharles	All & Grad.	$1,000	30
1851 Exhibition	Graduate	£250	31
Nipissing Mining Co.	Graduate	$1,100	33

THE BAPTIE SCHOLARSHIP

The Baptie Scholarship is derived from a bequest under the will of the late Mrs. Margaret W. Baptie, of Ottawa, and the Board of Governors has directed that from the income therefrom a scholarship of One Hundred Dollars shall be awarded for Engineering students on the record of their first year. . . . The Board of Governors also authorizes a remission of fees in the case of the holder of the scholarship up to Seventy-five Dollars.

The conditions of the award are as follows: That the scholarship be awarded to the student who, in the Annual Examinations of the First Year, enrolled in any one of the departments of Civil Engineering, Mining Engineering, Mechanical Engineering, Chemical Engineering, Electrical Engineering or Metallurgical Engineering, obtains the highest aggregate percentage of marks in those subjects which are common to the First Year curricula of those departments. The first award was made on the results of the annual examinations of the Session 1925-26.

HARVEY AGGETT MEMORIAL SCHOLARSHIP

This scholarship was donated by Mr. J. T. Aggett, of Toronto, as a perpetual memorial to his son, the late Lieutenant Harvey Aggett, who enlisted in March, 1915, during his second year in this Faculty, and was killed in action at Passchendaele on 6th November, 1917.

This annual scholarship of the value of seventy-five dollars is to be awarded to a student of the second year in this Faculty who, obtaining honours and being one of the first three in his year by his standing at the annual examinations, has been adjudged highest of the three in general student activities and service in the University during his period of attendance.

BOILER INSPECTION AND INSURANCE COMPANY SCHOLARSHIP

The Boiler Inspection and Insurance Company of Canada offers a Scholarship in the Department of Mechanical Engineering of the value of $150.00 to the student who obtains highest Honour Standing in the regular examinations of the third year.

The successful candidate will be expected to proceed to his fourth year during the session next following the date of the award.

The amount of the award will be credited by the Bursar to the fees of the fourth year of the successful candidate.

JENKINS SCHOLARSHIP IN ENGINEERING

The Jenkins Scholarship in Engineering, presented by Jenkins Bros., Limited, has been donated to continue for a period of five years, the first award having been made in 1925.

This annual scholarship, of the value of One Hundred Dollars, is to be awarded to the student of the third year registered in one of the six departments of Civil, Mining, Mechanical, Chemical, Electrical or Metallurgical Engineering, who has the highest aggregate of percentages for the first, second and third years.

MEDAL FROM MEMBERS OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

A Bronze Medal has been donated for students of the Faculty of Applied Science and Engineering by members of the British Association for the Advancement of Science. This Medal will be awarded to the student of the Fourth Year, in any department, who, taking honours, obtains the highest aggregate percentage in practical and written examinations in the year.

TORONTO ARCHITECTURAL GUILD MEDAL

The Toronto Architectural Guild was the organization of local architects from which sprung the Ontario Association of Architects. When the

new and wider association became firmly established, the Guild disbanded and handed over to a trustee board certain funds for the establishment of a Medal to be awarded in the Department of Architecture of the University of Toronto.

The Trustee Board, now that the fund has accumulated considerably, announces its intention of awarding this medal annually to a senior student showing outstanding ability in Architectural Design.

Ontario Association of Architects Scholarship

The Ontario Association of Architects offers a scholarship of One Hundred Dollars ($100.00), to the student of the second year in the Department of Architecture who at the annual examinations obtains the highest honour standing in Architectural Design, the scholarship to be awarded annually from 1928 to 1933 inclusive.

The Toronto Brick Company Prizes

The Toronto Brick Company offers two prizes, one of $75.00 and one of $25.00 to those students of the Third Year in the Department of Architecture who win first and second places in a competition arranged by the Staff in the Department of Architecture for this purpose.

Darling and Pearson Prize in Architecture

Messrs. Darling and Pearson, Architects, offer annually a prize of One Hundred Dollars ($100.00) in books to the student in the final year of the Department of Architecture who is assigned the highest marks in a special problem in Architectural Design, set for this purpose by the Department of Architecture. The books constituting this prize are to be selected by the successful candidate, with the approval of the Department of Architecture.

The first award of this prize was made in the Session 1927-28.

The Mathers and Haldenby Prize

Messrs. Mathers and Haldenby, Architects, offer a copy of "Architectural Construction", Vol. I, by Voss and Henry, annually for the next five years, (1928-1932 inclusive), as a prize to the student of the Third Year, Department of Architecture, who is awarded the highest honour standing for the set of measured drawings handed in at the beginning of the session as his Vacation Work.

The Rhodes Scholarship

The trustees of the late Mr. C. J. Rhodes have assigned two of the Rhodes Scholarships to the Province of Ontario.

These scholarships will hereafter be thrown into open competition in the Province, subject to the following conditions:—

1. Candidates must be British subjects, with at least five years' domicile in Canada, and unmarried. They must have passed their nineteenth, but not have passed their twenty-fifth birthday, on October 1st of the year for which they are elected.

2. Candidates must be at least in their Sophomore Year at some recognized degree-granting University or College of Canada, and (if elected) complete the work of that year before coming into residence at Oxford.

3. Candidates may compete either in the Province in which they have acquired any considerable part of their educational qualification, or in the Province in which they have their ordinary private domicile, home or residence.

In each Province there is a Committee of Selection, appointed by the Trustees, in whose hands the nominations will rest. The Secretary of the Committee of Selection for Ontario is D. R. Michener, Esq., Barrister, National Building, 347 Bay St., Toronto 2.

The Committees of Selection are instructed to bear in mind the suggestions of Mr. Rhodes, who wished that, in the choice of his Scholars, regard should be had to

(*a*) Force of character, devotion to duty, courage, sympathy, capacity for leadership.

(*b*) Ability and scholastic attainments.

(*c*) Physical vigor, as shown by participation in games or in other ways.

Every candidate for a Scholarship is required to furnish to the Committee of Selection for his Province the following:—

(*a*) A certificate of age.

(*b*) A photograph preferably unmounted and not larger than 4×7 inches.

(*c*) A written statement from the President or Acting President of his College or University to the effect that his application as a suitable candidate is approved.

(*d*) Certified evidence as to the courses of study pursued by the Scholar at his University, and as to his gradings in those courses. This evidence should be signed by the Registrar, or other responsible official, of his University.

(*e*) A brief statement by himself of his athletic and general activities and interests at College, and of his proposed line of study at Oxford.

(*f*) Not more than four testimonials from persons well acquainted with him.

(*g*) References to four other responsible persons, whose addresses must be given in full, and of whom two at least must be professors under whom he has studied.

It is in the power of the Committee of Selection to summon to a personal interview such of the candidates as they find desirable to see, and, save under exceptional circumstances, no Scholar will be elected without such an interview. Where such an interview is dispensed with, a written statement of the reasons will be submitted to the Trustees.

The next appointments will be made for 1929; applications for these Scholarships with all required material must reach the Secretary of the Committee of Selection not later than November 15th, 1928.

Each Scholarship is of the value of £400 a year, and is tenable for three years, subject to the continued approval of the College at Oxford of which the Scholar is a member.

Rhodes Scholars,, from this Faculty:—

W. J. Browne, B.A.Sc., 1919.
D. W. Dow, 1925.

The Khaki University and Y.M.C.A. Memorial Scholarship Fund

The Khaki University and Y.M.C.A. Memorial Scholarship Fund was established by the Khaki University Committee. At the present time this fund is being used to make loans to returned-soldier students of the higher years. Applications for such loans should be made to the President of the University.

The Jardine Memorial Prize for English Verse

1. This prize, of the value of $100, is the gift of the late Mrs. T. Herbert Barton in memory of her brother Flight-Lieutenant Gordon Jardine, and is open to any regular undergraduate student who has been in actual attendance at the University during the academic year preceding the date of submission (November 1) or who graduated in the previous academic year.
2. The subject and metre of the poem shall be left to the choice of the competitor.
3. The poems shall be in the hands of the Registrar of the University by November 1st.
4. Each poem shall be signed with a pseudonym and the competitor's name shall be submitted to the Registrar in a sealed envelope on which the pseudonym shall be written.
5. With his or her name the competitor shall enclose a signed statement that the poem is absolutely his or her original work.
6. The competition shall be judged by a board of five examiners, consisting of the head of the Department of English in each of the four colleges, and of a fifth examiner to be chosen by these four.
7. The examiners shall have the power to withhold the award in any year if no poem which has been submitted for that year be found worthy of the prize.

The Ubukata Fund

The S. Ubukata Fund of $10,000, the gift of Mr. S. Ubukata, provides for the establishment of prizes, medals, scholarships and loans for which Japanese students of all faculties and colleges may be eligible. Information regarding the conditions of award may be obtained from the Registrar of the University.

THE F. W. JARVIS BURSARIES

Two Bursaries, known as "The F. W. Jarvis Bursaries", of the value of $50 each, the gift of A. H. Jarvis, Esq., of Ottawa, brother of F. W. Jarvis, to be awarded under the following conditions:

1. These Bursaries are open only to former students of Ottawa Collegiate Institute (Lisgar Street), who without some such assistance may not be able to carry on their academic courses.

2. They may be awarded at Matriculation or in any year of an undergraduate course in any Faculty of the University.

3. They shall be awarded preferably one to a man and the other to a woman student; but if in any year students of opposite sexes do not apply, both Bursaries may be awarded to men or to women.

4. A Bursary may be held in successive years by the same student and also in conjunction with any scholarship awarded by the University or the federated colleges.

5. The Bursaries shall be awarded by the Senate of the University on the recommendation of a Committee of Award consisting of the President of the University, the Principal of Ottawa Collegiate Institute and the donor; candidates shall make application for the same not later than May 15th on the special form to be obtained from the Registrar.

THE UNIVERSITY OF TORONTO WAR MEMORIAL SCHOLARSHIPS

Four Scholarships, each of the value of two hundred and fifty dollars have been established by the Alumni Federation of the University from the War Memorial Fund to be awarded to students in the Faculties of Applied Science and Engineering and Forestry.

The general basis on which scholarships may be awarded shall be as follows: (*a*) Standing in course of studies. (*b*) Need of assistance. (*c*) Merit as shown in extra-academic activities—executive, literary, dramatic, athletic, etc. (*d*) Relationship, if any, to active service during the War.

Information regarding these scholarships may be obtained from the Secretary-Treasurer of the Alumni Federation, Room 225, Simcoe Hall, to whom applications for the same must be made not later than Feb. 15th.

THE MCCHARLES PRIZE

This prize was established in connection with the bequest of the late Æneas McCharles of Provincial Government bonds of the value of $10,000, and is awarded on the following terms and conditions, namely, that the interest therefrom shall be given from time to time, but not necessarily every year, like the Nobel prizes in a small way: (1) To any Canadian from one end of the country to the other, and whether student or not, who invents or discovers any new and improved process for the treatment of Canadian ores or minerals of any kind, after such process has been proved to be of special merit on a practical scale; (2) Or for any important

discovery, invention or device by any Canadian that will lessen the dangers and loss of life in connection with the use of electricity in supplying power and light; (3) Or for any marked public distinction achieved by any Canadian in scientific research in any useful practical line. The following conditions, as passed by the Board of Governors, determine the method of award:—

(1) The title shall be the McCharles Prize.

(2) The value of the prize shall be One Thousand Dollars ($1,000.00) in money.

(3) The term "Canadian" for the purpose of this award shall mean any person Canadian born who has not renounced British allegiance; and for the purpose of the award in the first of the three cases provided for by the bequest, domicile in Canada shall be an essential condition.

(4) Every candidate for the prize shall be proposed as such in writing by some duly qualified person. A direct application for a prize shall not be considered.

(5) No prize shall be awarded to any discovery or invention unless the same shall have been proved to the satisfaction of the awarding body, to possess the special practical merit indicated by the terms of the bequest.

(6) The order of priority in which the three cases stand in the wording of the bequest shall be observed in making the award; that is, the award shall go *caeteris paribus* to the inventor of methods of smelting Canadian ores; and, failing such inventions, to the inventor of methods for lessening the dangers attendant upon the use of electricity; and only in the third event, if no inventors of sufficient merit in the field of metallurgy and electricity present themselves, to the inventor distinguished in the general field of useful scientific research.

(7) The first award was made in 1910.

(8) The composition of the awarding body shall be as follows:—

An expert in Mineralogy,
An expert in Electricity,
An expert in Physics,

and four other persons. All of the members of this body shall be nominated by the Board of Governors of the University of Toronto.

The 1851 Exhibition Science Research Scholarship

The Royal Commissioners for the Exhibition of 1851, if satisfied with the qualifications of the candidates put forward, will each year allot three Science Research Scholarships to Canada. The University of Toronto has been invited to recommend annually one or more candidates in order of merit for these Scholarships.

1. Each candidate recommended must be a British subject and under twenty-six years of age, except under very special circumstances; he must

be a bona fide student of Science of not less than three years' standing; he must also have completed a full University course and have spent at least one full academic year at this University prior to the date of recommendation.

2. The record of a candidate's work must indicate high promise of capacity for advancing science or its applications by original research. Evidence of this capacity, which is the main qualification for the Scholarship, is strictly required. The most suitable evidence is a satisfactory account by the candidate of research work already performed, and the Commissioners will decline to consider the claims of a candidate unless such an account is furnished, or unless there is other equally distinct evidence that he possesses this qualification.

3. Applications for these Scholarships must be made to the Registrar of the University not later than April 15th; the latest date on which the recommendation of the University of Toronto for Scholarships offered in 1929 can be received at the Office of the Commissioners is June 1st, 1929.

4. Each Scholarship is of the value of £250 per annum, payable quarterly in advance; on presenting to the Commissioners a satisfactory final report at the expiration of his Scholarship the scholar will receive a grant of £25. A scholar who is not in a position to travel at his own expense, or for whom it is not possible to obtain free passage, may make application to the Commissioners for aid towards the payment of his fare from his home to his place of study. A Scholar will receive an additional annual allowance, not exceeding £30, towards the cost of University fees, if, in the opinion of the Commissioners, he is in need of such allowance.

5. The Scholarship will be tenable ordinarily for two years, and in cases of exceptional merit for three years. The continuation of a Scholarship for a second year will depend upon the satisfactory nature of the scholar's first year's work. Renewal for a third year will be granted only where it appears that the renewal is likely to result in work of scientific importance.

6. The scholar will be required to devote himself to research in some branch of pure or applied science, the particular nature of the work proposed to be approved by the Commissioners.

7. A scholarship may be held, with the approval of the Commissioners, at any Institution in the United Kingdom or abroad, but a scholar will not be permitted, except under very special circumstances, to conduct his investigations in the country in which he has received his scientific education.

8. Scholars will be required to furnish reports of their work at the end of each year of tenure of their scholarships.

9. Scholars will be required to devote their whole time to the objects of the scholarship, and will be forbidden to hold any position of emolument

which carries with it a duty inconsistent with their obligation to the Commissioners. Scholars must in any case obtain the consent of the Commissioners before accepting any additional emoluments.

10. In case of misconduct on the part of a scholar the Commissioners may, at their absolute discretion, deprive him of his scholarship and all emoluments therefrom.

The regulations adopted by the Senate are as follows:—

The departments, students of which shall be eligible to be candidates. are:—1. Bacteriology; 2. Biochemistry; 3. Botany; 4. Chemistry; 5. Engineering (chemical); 6. Engineering (civil); 7. Engineering (electrical); 8. Engineering (mechanical); 9. Engineering (metallurgical); 10. Engineering (mining); 11. Forestry; 12. Geology; 13. Mineralogy; 14. Physics; 15. Physiology; 16. Zoology.

A student shall not be deemed to be ineligible because of his being on the teaching staff of the University, if he has not been in receipt of a salary of more than $800 per annum and has not been on the teaching staff for more than two years from graduation.

A student shall be deemed to be eligible in the year in which he intends to graduate, but if nominated for the Scholarship his nomination shall be subject to his being successful in passing his examination for his degree.

The nomination of the candidate or candidates shall be made by a Board composed of seven members appointed by the Senate, and the Board shall consist of the Chancellor, the President, the Reverend Dr. Bowles, the Honourable Mr. Justice Masten, the Honourable W. E. Raney, and Dr. C. Morse, and the Board shall have power to call to its aid as assessor any member of the teaching staff.

THE NIPISSING MINING COMPANY RESEARCH FELLOWSHIP

The Nipissing Mining Company has endowed a Research Fellowship in the Department of Mining Engineering to be known as The Nipissing Mining Company Research Fellowship, of the annual value of eleven hundred dollars ($1,100.00).

This Fellowship is open to the graduates of any University.

JUNIOR INSTRUCTORSHIPS

Provision is made for the sessional appointment in various departments of graduates as Fellows or Demonstrators, whose duties shall consist of aiding in the work of instruction under the direction of the department concerned.

Applications for appointment should be made in writing to the Secretary of the Faculty not later than September 1st.

Research Assistantships

A number of research assistants in the School of Engineering Research are appointed annually on salary, in the various departments, to carry on the work of research under the direction of members of the staff. This work is accepted as partial fulfilment of the requirements for the degrees of M.A.Sc. and M.Arch. These research assistants are usually recent graduates and are chosen from among those who have displayed special capacity for investigational work in their undergraduate courses. Prospective applicants should consult with members of the staff as soon as possible after the annual examinations.

REGULATIONS RESPECTING EXAMINATIONS

Regular Examinations

Promotions from one year to another are made on the results of the term work and the annual examinations. A Student proceeding to a degree must pass all the term work and the examinations in the subjects of his course and at the periods arranged from time to time by the Council.

Candidates who fail to pass in any year will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they fail before presenting themselves a second time for examination. (This repetition includes vacation work.)

A student who in either term of the session fails to perform the work of his course in a manner satisfactory to the professors in charge, will not be allowed to present himself at the final examinations of the year.

Annual examinations will be held at the beginning of the second term on all subjects completed during the first term.

No student will be allowed to write at any examination who has not paid all fees and dues for which he is liable at that time.

The pass marks required on written examinations is 40% and on practical examinations 60%.

Honours will be granted in each department to the students who obtain at least 50 per cent. in each subject, and 75 per cent. of the total number of marks allotted to the department at the annual examinations.

Honour Graduate standing will be granted to those who obtain honours in the final and in one previous year.

Term Examinations

Term examinations may be held in any subject and at any time at the discretion of the instructor or by order of the Council, and the results of such examination may, if the Council so decides, be incorporated with those of the annual examinations in the same subjects.

SUPPLEMENTAL EXAMINATIONS

A candidate who fails in one or two subjects at the Annual Examinations will be required to take supplemental examinations in such subjects; but no student will be allowed a supplemental examination in the laboratory work of the fourth year, those reported as failing to attain the required standard in this laboratory work not being allowed to present themselves at the final examinations.

The supplemental written examinations will begin on the 19th day of September, 1928. Notice in writing of his intention of taking such examinations (including practical ones) must be received from the candidate by the Secretary of the Faculty, and the fee of $10.00 received by the Bursar, not later than the first of September. Council reserves the right to reject applications of, or impose penalties upon, those failing to comply with these requirements. Arrangements will be made to conduct supplemental examinations at the Survey Camp for those students in attendance.

In the case where a candidate desires to write upon an annual examination as a supplemental his application must be received by the Secretary, and his fee by the Bursar, for the January examinations not later than the first of December and for the April examinations not later than the first of March.

Where a candidate fails to pass a supplemental examination it will be counted as one of the two supplemental examinations which may be allowed him after the next annual examination.

No student will be permitted to take the work required for a laboratory supplemental examination at any time other than the regular time of the session.

OFFICE EXPERIENCE

Department of Architecture

Candidates for the degree of Bachelor of Architecture will be required to submit to Council satisfactory evidence of having worked at least twelve months in the office of a member of the Ontario Association of Architects before receiving their degrees. Evidence of work in the office of an architect residing outside of the Province may be substituted, providing that he is a member of the local professional organization.

FIELD EXPERIENCE

Department of Mining Engineering

The following are the regulations governing field experience certificates:

A candidate for the degree in the Department of Mining Engineering will be required to present satisfactory evidence of having had at least six months' practical experience in work connected with mining, metallurgy or geology, for which he must have received regular wages.

The time may be spent on geological survey, in ore dressing, smelter or lixiviation works, in an assay office in the vicinity of mining or metallurgical works, on any work in or about a mine other than as an office man or clerk, or in prospecting. Not more than three months on geological surveys will be accepted, and prospecting will only count one-half (*i.e.*, four months' prospecting will be counted as two months) and must not be submitted for more than three of the six months.

Certificates must be made out, signed, countersigned and sent during the first term to the Secretary of the Faculty of Applied Science and Engineering, who will retain them.

SHOP WORK

Departments of Mechanical and Electrical Engineering

Students in Mechanical and in Electrical Engineering are not granted their degree until certificates have been submitted to the Council, and accepted as satisfactory, showing not less than 1,600 hours of mechanical experience in production under commercial conditions. Preferably the work undertaken should be in one of the manufacturing industries or trades with which the course is related. Certificates, on the standard form which may be procured from the Secretary, must be presented on or before the 1st of March of any year.

It is not desirable that a student in these courses should enter the engineering industries without having acquired some experience in mechanical production and it is therefore required that he obtain this experience under commercial conditions, so that he can appreciate shop conditions and limitations.

REGULATIONS RESPECTING TERM WORK

Students working in any laboratory must be governed by the regulations relating thereto as made known from time to time.

No laboratory reports or drawings may be removed from the laboratories without permission. The Council reserves the right to dispose of them as may be thought proper.

No drawings or briefs will be accepted which have not been made in the drafting rooms, and during the hours allotted to such work.

FIELD WORK

Field Work in Surveying of the First and Second Years will be taken on the University grounds, during the first term.

No field notes will be accepted which have not been taken in the field and during the hours allotted to such work.

Students taking practical astronomy are required to take observations in the field for time, latitude and azimuth.

EXCURSIONS TO POINTS OF INTEREST

As a part of Laboratory Instruction excursions to points of technical interest, both in Toronto and elsewhere, are arranged by the staff. These excursions are treated as laboratory periods with the same requirements as to attendance and reports. The total transportation costs in any one year will probably not exceed Ten Dollars.

A limited number of similar excursions may be arranged by the Engineering Society and its constituent Clubs within the Faculty with the approval and co-operation of the department or departments concerned. These excursions being also for instructional purposes are to be treated as laboratory periods.

SUMMER SURVEY SESSION

Students in Departments 1 and 2 will be required to take the Survey Camp between the second and third years, and on failure to do so this work will be taken as a supplemental in the third year. The work will be taken previous to the opening of the fall term, during the months of August and September at the University Survey Camp, situated on the shore of Gull Lake, and about five miles from the Village of Minden (Lot No. 9 in 13th Concession of the Township of Lutterworth). The camp may be reached by taking the train leaving Lindsay for Haliburton, and getting off at Gelert. Conveyances will be on hand to meet students and take them to the camp. Personal effects must be limited to sixty pounds in weight, which must include two pairs of blankets, or their equivalent; beds and mattresses only will be provided.

A field course in Geology is given to students in Department 2 the last week of the session at the camp.

Students will report at the camp on the dates shown on page 7.

Students of the Fourth Year in Department 1 who are taking the Astronomy Option are required to spend two weeks at the camp, beginning September 8th, after completing their Third Year.

THESIS

In the Fourth Year each student is required to prepare a thesis. The title, form and time for handing in will be determined for each Department as provided in the prescription, 285, page 114. It shall become the property of the University.

The thesis of each student who works upon a research problem in his fourth year must deal with the subject of investigation. In such cases the theses must be handed in not later than one week prior to the close of the annual examinations.

REGULATIONS RESPECTING STUDENTS IN ATTENDANCE

All interference on the part of any student with the personal liberty of another by arresting him, or summoning him to appear before any unauthorized tribunal of students, or otherwise subjecting him to any indignity or personal violence, is forbidden by the Caput.

A student who is under suspension, or who has been expelled from a College or from the University, will not be admitted to the University buildings or grounds.

The name of the University is not to be used in connection with a publication of any kind without the permission of the Caput.

No student will be enrolled in any year, or be allowed to continue in attendance, whose presence is deemed by the Council to be prejudicial to the interests of the University.

Students proceeding regularly to the degree are required to attend the courses of instruction and the examinations in all subjects prescribed for students of their respective standing, and no student will be permitted to remain in the University who persistently neglects academic work.

Unless special permission is granted by the Council, a student who, at the close of two sessions in the University, has failed to secure standing in his year, will not be permitted registration in the Faculty of Applied Science and Engineering.

The constitution of every University society or association of students in the Faculty of Applied Science and Engineering and all amendments to any such constitution must be submitted for approval to the Council of the Faculty. All programmes of such societies or associations must, before publication, receive the sanction of the Council of the Faculty through the Dean. Permission to invite any person not a member of the Staff of the University to preside at or address a meeting of any society or association must be similarly obtained.

The Students' Administrative Council has been entrusted by the Caput with supervision of the conduct of the students, and subject to the approval of the Caput, has power, through the Students' Court or otherwise to deal with violations of the regulations governing conduct.

No initiation ceremony involving physical violence, personal indignity, interference with personal liberty or destruction of property, may be held by the students of any Faculty or College of the University under the penalty of suspension or expulsion.

Students of the Faculty of Applied Science and Engineering, on the premises of Colleges or Faculties other than those in which they are registered, shall be subject to the regulations and penalties imposed by the administrative authorities of the premises concerned.

Any ceremony connected with the reception of the First Year desired by any Faculty or College must be prepared and carried out by a Committee of the Senior Year of the Faculty or College concerned, with the approval of a joint committee of the Caput and the Students' Administrative Council. The holding of such ceremonies except with this approval shall constitute a breach of discipline.

Any student who may be convicted of having taken part in a parade or procession through the city which has not been authorized by the police authorities after application by the Executive of the Students' Administrative Council, will be severely disciplined.

EXEMPTIONS

Applications for exemption from any of the regulations shall be made to the Council in writing and the particulars of the case fully stated.

A student shall submit to Council evidence of illness or other handicap which occurs during the session immediately after its occurrence: no petition for leniency on account of such incidents will be considered if received after the third day following the last day of examinations.

GENERAL INFORMATION FOR STUDENTS

The Council of University College and the governing bodies of the federated universities and colleges, respectively, have disciplinary jurisdiction over and entire responsibility for the conduct of their students in respect of all matters arising or occurring in or upon their respective college buildings and grounds, including residences.

The councils of such of the faculties as have assigned for their separate use any building or buildings and grounds, including residences, have disciplinary jurisdiction over and entire responsibility for the conduct of all students in their respective faculties in respect of all matters arising or occurring in or upon such building, or buildings and grounds.

In all such cases, and, save as aforesaid, as respects all students to whatsoever college or faculty they may belong, disciplinary jurisdiction is vested in the Caput, but the Caput may delegate its authority in any particular case or by any general regulation to the council or other governing body of the university or college or faculty to which the student belongs.

The Caput has also power and authority to determine by general regulations, or otherwise, to what college, faculty or other body the control of university associations belongs.

If there be any questions as to the proper body to exercise jurisdiction in any matter of discipline which may arise, the same shall be determined by the Caput, whose decision shall be final.

Disciplinary jurisdiction includes the power to impose fines.

Information as to the text-books, instruments and materials to be purchased by the students will be given on registration at the beginning of the session.

HART HOUSE

Hart House, the gift of the Massey Foundation, is so called in memory of Mr. Hart Massey. In its widest interpretation it seeks to provide for all the activities in the undergraduate's life apart from the actual work in the lecture room. It affords all the facilities of a first-rate club. In the beauty of its architecture and the various functions which it performs it is unique on this continent.

Hart House contains completely equipped club rooms, including common rooms, reading room, music room, lecture room, sketch room, photographic dark rooms, the Great Hall, which is the students' dining hall, a small Chapel, rooms reserved for religious organizations in the University, gymnasia, squash courts, swimming pool, running track, rifle range, billiard room, library and Hart House Theatre.

Hart House is open from 8.00 a.m. to 11.00 p.m. daily and meals are served in the Great Hall throughout the academic year. Members are entitled to full privileges of all rooms in the building between these hours and the use of the gymnasia, pool, showers and locker rooms until 6.30 p.m. each day, except Sunday, subject to the regulations of the Athletic Association.

The Library contains a good selection of books of general interest. These books must not be taken from the room.

Sunday Evening Concerts are given by the leading musicians of the city at 9 p.m. in the Great Hall on certain Sundays during the session and music recitals take place at 5 p.m. every Friday in the Music Room.

The Sketch Room is equipped with facilities for drawing and painting. Weekly drawing and painting classes are given by a qualified instructor and frequent exhibitions of pictures and lectures on Art are arranged.

A group of rooms is set apart for the use of the Faculty Union. A dining room and a common room are also reserved for Graduate Members. Six bed-rooms are available for the use of guests at a reasonable charge.

The Warden is entrusted with the general supervision of the whole house in co-operation with the following committees: House, Hall, Library, Music, Billiard, Sketch, Camera and Squash. These committees consist of two senior members, a graduate member, the Warden and a full representation of undergraduates. The undergraduates are elected annually by their fellow students. The Board of Stewards is the Senior Committee and has final control of the House, being directly responsible to the Board of Governors. It consists of the Warden (*ex officio* chairman) and representatives of the President of the University, the Board of Governors, the Faculty Union, the Athletic Association, the Graduate Members, the Student Christian Association, the Students' Administrative Council and the undergraduate secretaries of all Standing Committees.

All male undergraduates proceeding to a degree in the University are members of Hart House. The annual fee of $10.00 covers all fees in connection with Hart House and membership in the Athletic Association for the academic year (September to May). Membership Cards may be obtained at the Warden's Office on presentation of the Bursar's receipt for fees paid.

Hart House has no endowment whatsoever and is entirely dependent for its upkeep on the fees received from graduates and undergraduates and from various sources of revenue in the House itself.

Other male students in the University, or students in the affiliated or federated institutions receiving instruction in the University, may become members of Hart House on payment of the required fee at the Warden's office.

Graduates resident in Toronto and out-of-town graduates are entitled to the full privileges of Hart House on payment of an annual fee.

HART HOUSE THEATRE

Hart House Theatre is a Repertory Theatre existing to promote the interests of dramatic art in the widest sense. Its performances are open to members of the University and to the general public. The Theatre is operated by a Board of Syndics, who are responsible to the Governors of the University for its administration. It is the policy of the Syndics to permit the use of the Theatre by those dramatic societies within the University which are endeavouring to do serious work.

STUDENTS' ADMINISTRATIVE COUNCIL

The Students' Administrative Council has been entrusted by the Caput with supervision of the conduct of the students, and has power subject to the approval of the Caput to deal with violations of the regulations governing conduct.

Any student who may be convicted of having taken part in a parade or procession through the city which has not been authorized by the police authorities after application by the Executive of the Students' Administrative Council, will be severely disciplined.

The functions of the Council are as follows:

(1) To represent the students on public occasions on matters affecting their interests.

(2) To promote inter-university functions.

(3) To deal with such breaches of discipline on the part of the male student body of the University of Toronto as shall be brought before it.

Members are elected to the Council annually by undergraduates registered in the University of Toronto and its affiliated colleges.

The Council prepares annually a list of approved rooming houses for male students which may be consulted at the opening of the session, in Hart House.

THE JOINT EXECUTIVE, STUDENTS' ADMINISTRATIVE COUNCILS

The Joint Executive, Students' Administrative Councils, is comprised of the Executives of the Students' Administrative Council and the Women Students' Administrative Council. The Joint Executive assumes the financial responsibility for the publication of *The Varsity*, *Torontonensis* and the *Students' Handbook*, and also affords a recognized means of communication between the authorities and the Students' Administrative Councils. It represents the students at University functions and on public occasions and receives and administers all funds accruing from Student Council fees, revenues from publications and such other funds as shall become the property of the Executive.

The annual fee for the Students' Administrative Councils paid by all undergraduates proceeding to a degree, provides for a year's subscription to *The Varsity* and entitles the student to a copy of *Torontonensis* on graduation. The fee also covers administration costs of the Joint Executive and Students' Administrative Councils.

UNIVERSITY OF TORONTO ATHLETIC ASSOCIATION

University Athletics for men are under the entire control of the University of Toronto Athletic Association, of which the executive body is the Athletic Directorate. This consists of:

The President of the University,
Two members of the faculty, appointed by the President,
Two graduates, appointed by the Athletic Advisory Board,
The Medical Director and the Financial Secretary (*ex officio*),
Five undergraduates, elected annually,
An undergraduate representative, appointed by the Executive of the Students' Administrative Council.

The Directorate alone has the power to sanction the use of the name "The University of Toronto" in connection with men's athletics, and no athletic event can be held in the University without its approval. It has control of the Athletic Field, the Gymnasium, the Swimming Pool, and other conveniences in connection with Athletics in Hart House, and is empowered by the Board of Governors to make the necessary arrangements to effect the carrying out of the University regulations requiring Physical Training for men.

THE GRADUATING DEPARTMENTS

The instruction in the various departments leading through the four years to the degree of B.A.Sc. and five years to the degree of B.Arch. is designed to give the student a thorough grounding in the fundamentals of the engineering and architectural professions, and in addition a sufficient familiarity with applications of the principles to make him immediately useful upon graduation.

With the exception of Architecture and Chemical Engineering the various courses are very similar in the first year. The succeeding years are devoted to the more particular work of the departments. In the fourth year specialization develops to the extent of various options.

The graduating courses are so designed, with many subjects common to the departments of the several years, that the student upon graduation will find himself sufficiently equipped in the various fundamentals to pursue readily his studies in branches other than the one in which he has graduated and indeed to be useful in them as well. The courses in this Faculty are not planned to make specialists; the process of specialization is more properly deferred until after graduation.

In the teaching of the fundamentals, instruction is not confined wholly to applied science. As the future engineer is vitally concerned with the development of the country, it is essential that he be instructed as well in certain fundamentals in economics, administration and business which, in conjunction with his scientific training, will enable him to develop his full value.

In some departments laboratory work in the fourth year consists of an investigation of some specific problem. In all cases the student's knowledge of the original literature and primary sources of information is extended, and he is given a very desirable and useful training in methods of research. In this way the undergraduate course is linked with the graduate course (see p. 116) and with the work of the School of Engineering Research (see p. 115).

On the following pages the courses of instruction in the different departments are set forth in detail. The time devoted to lectures and practical work is indicated as accurately as possible, but is subject to modification from time to time as occasion may require.

For further information concerning the opportunities available for graduates of this Faculty, reference should be made to the pamphlet issued by the Director of Extension Work and Publicity of the University entitled "Opportunities for Graduates in Applied Science."

1. DEPARTMENT OF CIVIL ENGINEERING

The course in Civil Engineering is designed to meet the needs of the students who intend to take up such work as Geodetic Surveying, Railway Engineering, Municipal Engineering, Sanitary Engineering, Highway Engineering, Structural Engineering, Hydraulic Engineering, and administrative work in connection with both Engineering and Industrial undertakings.

FIRST YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Geometrical Optics	185 (*b*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	280	0	2	0	2

SECOND YEAR

Subject	No.	Hours per week			
		First Team		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	237	1	1	1	1
Spherical Trigonometry	239	1	0	0	0
Elementary Astronomy	71	1	0	1	0
Descriptive Geometry	162	1	0	1	0
Surveying	272, 273	1	9	1	0
Dynamics	3	1	0	1	0

Civil Engineering—Second Year—Cont.

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Mechanics of Materials......	4	2	0	2	0
Engineering Chemistry......	93	1	0	0	0
Inorganic Chemistry	87A	1	0	0	0
Organic Chemistry..........	95	0	0	1	0
Metallurgy.................	241	0	0	1	0
Geology....................	195	0	0	2	0
Mineralogy.................	257,259	2	1	0	2
Hydrostatics...............	186	0	0	1	1
Heat.......................	187	1	1½	0	0
Photography................	188	1	1½	0	1½
Economics & Finance.......	123	1	0	1	0
Chemical Laboratory........	89	0	0	0	6
Engineering Drawing........	169	0	4½	0	13½
Physical Training..........	280	0	2	0	2

Third Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Survey Camp............	275	...	...	...	...
Engineering Chemistry....	102	1	0	1	0
Theory of Structures......	6	2	0	2	0
Thermodynamics.........	223, 224	1	0	1	2
Hydraulics...............	205, 206	2	0	2	3
Least Squares............	240	0	0	1	0
Practical Astronomy and Geodesy...............	72, 73	2	2	2	0
Descriptive Geometry.....	164	1	0	0	0
Surveying and Levelling...	274	1	0	1	0
Electricity...............	143, 144(*a*)	1	3	1	0
Stress Graphics...........	10	1	0	1	0
Cements and Concrete....	11	0	0	1	0
Engineering Geology......	197	1	0	1	0
Commercial Law.........	124	1	0	1	0
Public Speaking..........	133	1	0	0	0
Mechanics of Materials Laboratory............	9	0	3	0	0
Engineering Drawing......	173	0	15	0	12

CIVIL ENGINEERING—FOURTH YEAR

(a) Astronomy Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Survey Camp..........	275	..	..	..	..
Thesis.................	285	0	3	0	0
Engineering Economics..	125	0	0	1	0
Engineering Law........	126	1	0	0	0
Contracts and Specifications...............	127	0	0	1	0
Management...........	128	1	0	0	0
Astronomy.............	74, 76	2	23	2	0
Geodesy...............	75, 76	2	0	2	23
Photographic Surveying.	191 (*b*)	1	2	0	0

FOURTH YEAR

(b) Municipal Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis.................	285	0	3	0	0
Engineering Economics..	125	0	0	1	0
Engineering Law........	126	1	0	0	0
Contracts and Specifications...............	127	0	0	1	0
Management...........	128	1	0	0	0
Reinforced Concrete.....	15	1	0	1	0
Foundations...........	14	1	0	1	0
Hydraulics.............	211	1	3	0	0
Structural Design.......	17	1	0	0	0
Structural Design Drawing.................	179	0	0	0	5
Miscellaneous Structures	19	0	0	1	0
Hygiene and Bacteriology...............	82	1	0	1	6
Biology................	81	0	5	0	0
Sanitary Chemistry.....	117	1	6	0	4
Sanitary Engineering....	267	1	3	1	6
Highway Engineering...	268	1	3	1	3
Municipal Government and Administration...	269	2	2	2	2

CIVIL ENGINEERING—FOURTH YEAR—(c) Structural Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Physical Metallurgy	252	1	0	1	0
Structural Design	17, 18	2	0	1	0
Miscellaneous Structures	19	0	0	1	0
Mechanics of Materials Laboratory	13	0	3	0	6
Structural Design Drawing	178	0	22	0	22

FOURTH YEAR—(d) Hydraulic Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Hydraulics	207, 208, 209	3	10	3	10
Physical Metallurgy	252	1	0	1	0
Structural Design	17, 18	2	0	1	0
Miscellaneous Structures	19	0	0	1	0
Electrical Laboratory	144 (*a*)	0	0	0	3
Mechanics of Materials Laboratory	13	0	6	0	3
Structural Design Drawing	179	0	4	0	8

CIVIL ENGINEERING—FOURTH YEAR

(e) Railway Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Hydraulics	211	1	3	0	0
Special Geology	204	0	0	1	1½*
Physical Metallurgy	252	1	0	1	0
Electrical Laboratory	144 (*a*)	0	0	0	3
Motive Power	225	1	0	1	0
Railway and Miscellaneous Structures	20, 19	1	0	1	0
Railway Economics	131	2	0	2	0
Railway Location and Design	276	1	8	1	8
Mechanics of Materials Laboratory	13	0	3	0	6
Structural Design Drawing	179	0	6	0	6

*The ½ hour represents two excursions during the term.

2. DEPARTMENT OF MINING ENGINEERING

The course in Mining Engineering, which originated in 1878 as a course in Assaying and Mining Geology, is intended to serve as a preliminary training for those who expect to practice in some branch of Mining Engineering, such as exploration of mining areas and primary development, mine surveying, mining processes involving civil, mechanical, and electric work of underground workings, mining machinery and operation; milling and treatment of ores, assaying and other forms of analysis and research, and administrative work in connection with both Engineering and Industrial undertakings.

FIRST YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Descriptive Geometry	160	1	0	1	0
Engineering Drawing	166	0	9	0	12
Surveying	270, 271	1	6	1	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Mineralogy	255, 258	2	1	0	3
Technical English	122 (a)	1	0	1	0
Business	121	0	0	1	0
Mining Laboratory	50	0	0	0	3
Physical Training	280	0	2	0	2
Problems and Seminar		0	3	0	3

MINING ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work........	184	..	..	..	..
or Vacation Work....	68	..	..	..	..
Descriptive Geometry..	162	1	0	1	0
Engineering Drawing...	169	0	3	0	10
Surveying............	272, 273	1	6	1	0
Dynamics............	3	1	0	1	0
Electricity...........	143	1	0	1	0
Mechanics of Materials.	4	2	0	2	0
Theory of Measurements..............	65	1	0	0	0
Inorganic Chemistry...	87A	1	0	0	0
Inorganic Chemistry....	87B	0	0	1	0
Chemical Laboratory...	89, 90	0	6	0	6
Metallurgy...........	241	0	0	1	0
Geology..............	195	0	0	2	0
Dynamic and Structural Geology...........	198	1	0	0	0
Mineralogy...........	260, 261	1	2	1	2
Mining...............	51, 53	1	3	0	0
Steam Engines.........	216	1	0	0	0
Economics & Finance...	123	1	0	1	0
Physical Training......	280	0	2	0	2
Problems & Seminar....		0	3	0	3

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work........	69	..	..	..	..
Survey Camp..........	275	..	..	..	..
Geological Field Work..	193	..	..	..	..
Theory of Structures...	7	2	0	0	0
Hydraulics............	205, 206	2	0	2	3
Engineering Chemistry..	102	1	0	1	0
Analytical Chemistry,..	88, 99	1	3	1	6
Economic Geology.....	202, 203	1	0	3	2
Petrography...........	262, 263	1	2	1	2
Metallurgy............	243	1	0	1	0
Mining..............	54	1	0	1	0

MINING ENGINEERING—THIRD YEAR—Cont.

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Introd. Research	66	0	0	0	3
Ore Dressing	58, 59	1	3	1	3
Physics of Ore Dressing	64	1	0	1	0
Assaying	45, 46	1	3	0	3
Engineering Drawing	174	0	9	0	0
Problems & Seminar		0	3	0	3

FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	70	..	..	..	..
Thesis	67	0	7	0	9
Mine Cost Keeping and Management	56	1	0	1	0
Mining	55	1	0	1	0
Ore Dressing	60, 61	1	6	1	0
Assaying	47, 48	0	0	1	3
Geology, Pleistocene and Physiographic	194, 201	1	1	1	0
Geology, Precambrian	199	2	0	0	0
Geology, Mining	200	0	0	2	0
Metallurgy	247	1	0	1	6
Thermodynamics	223, 224	1	3	1	0
Machine Design	234	1	0	1	3
Engineering Economics	125	0	0	1	0
Physical Metallurgy and Metallography*	244	2	3	0	0
Mechanics of Materials Laboratory	9	0	0	0	3
Electrical Laboratory	144 (b)	0	3	0	0
Problems & Seminar		0	3	0	3

*Commencing 1929-30.

3. DEPARTMENT OF MECHANICAL ENGINEERING

The course in Mechanical Engineering is intended to serve as a preliminary training for those who intend to take up work connected with the design, manufacture, installation, or operation of machinery for the use of power as generated by steam, gas, oil, and water, and machinery and methods for the production, transportation, and handling of material, heating, ventilation, refrigeration, compressing of air, pumping of water, and all problems of a mechanical nature, and administrative work in connection with both Engineering and Industrial undertakings.

An Aeronautical Engineering Option is established in the Department of Mechanical Engineering embracing the Third and Fourth Years, the prescription of which is given below.

As the Aerodynamic Laboratory accommodation is limited, it may be found necessary to limit the number taking this Option in which case preference will be given to those who have exhibited, during the junior years, marked ability in mathematics, both pure and applied.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Illuminating Engineering	185 (*a*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	280	0	2	0	2

MECHANICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	237	1	1	1	1
Descriptive Geometry	162	1	0	1	0
Dynamics	3	1	0	1	0
Mechanics of Materials	4, 9	2	0	2	3
Engineering Chemistry	93	1	0	0	0
Inorganic Chemistry	87A	1	0	0	0
Organic Chemistry	95	0	0	1	0
Metallurgy	241	0	0	1	0
Hydrostatics	186	0	0	1	0
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Steam Engines	216	1	0	1	0
Theory of Mechanism	230	2	$1\frac{1}{2}$	2	$1\frac{1}{2}$
Compound Stress	10*a*	0	0	1	0
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89	0	0	0	6
Engineering Drawing	170	0	15	0	$7\frac{1}{2}$
Physical Training	280	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Theory of Structures	7	2	0	0	0
Thermodynamics	217, 219	2	3	2	3
Hydraulics	205, 206	2	0	2	3
Heat Engines	218	2	0	2	0
Mechanics of Machinery	231	1	0	1	0
Machine Design	233	2	4	2	10
Magnetism & Electricity	138, 140	1	3	1	$4\frac{1}{2}$
Alternating Current	139	1	0	1	0
Physical Metallurgy	244	0	0	2	0
Engineering Drawing	177	0	9	0	9

(*a*) Aeronautical Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry..	102	1	0	1	0
Physical Metallurgy....	244	0	0	2	0
Theory of Structures...	7, 177	2	9	0	0
Thermodynamics......	217, 219	2	3	2	3
Heat Engines.........	218	2	0	0	0
Hydraulics............	205, 206	2	0	2	3
Mechanics of Machinery	231	1	0	1	0
Machine Design.......	233	2	3	2	9
Magnetism & Electricity................	138, 140	1	3	1	4½
Alternating Current....	139	1	0	1	0
Advanced Calculus.....	—	2	1	2	1
Aeronautics, General...	301	1	0	1	0
Elementary Aerodynamics................	302	0	0	2	0

MECHANICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis.................	285	0	1	0	1
Engineering Economics.	125	0	0	1	0
Structural Design.......	17, 18, 180	2	3	0	0
Heat Treatment of Iron and Steel............	253	1	0	1	0
Industrial Management.	130	1	0	1	0
Reinforced Concrete....	15	1	0	0	0
Machine Design........	235	2	7	2	7
Thermodynamics.......	220, 221, 222	3	7	3	8
Hydraulics............	207, 208, 209	3	7	3	8

(*a*) Aeronautical Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	1	0	1
Engineering Economics	125	0	0	1	0
Industrial Management	130	1	0	1	0
Heat Treatment of Iron, Steel	253	1	0	1	0
Thermodynamics	220, 222	2	6	2	6
Theory of Structures	12	2	0	2	0
Differential Equations	—	2	1	2	1
Aerodynamics	303	1	0	1	0
Aerodynamic Laboratory	304	0	6	0	6
Aircraft Materials	305	1	0	0	0
Aeroplane Design and Stress Analysis	306	2	8	2	8
Aircraft Propellers	307	1	0	1	0
Aircraft Engines	308	1	0	1	0

THE DEPARTMENT OF ARCHITECTURE

The instruction in this Department is arranged mainly to lay a broad foundation for the subsequent professional life of its graduates. A very considerable portion of the course is devoted to architectural design, and a student on graduating should have a thorough knowledge of the broad principles of this important subject, a cultivated taste and an appreciation of the allied arts. In addition, a comprehensive course is given in the various subjects connected with building, and French history, literature and conversation and English literature are taught in the first three years.

Under the new course of five years (to include students registering in the first year of the session 1928-1929) a student is required to spend twelve months in the offices of recognized architects. This very important practical work is done in the long summer vacations and satisfactory evidence of its completion must be submitted before the granting of a degree. During the period between graduation and the practice of his profession, the student divides his time between the architect's office, where his previous training in drawing and building construction stand him in good stead, and travel abroad, where he finds the taste which he has formed and his knowledge of the history of architectural development and of the French language better equip him for an appreciation of the architecture of the countries which he visits.

Students registered in the Department of Architecture prior to 1928 will continue the course prescribed in the calendar for 1927-1928.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	161	1	0	1	0
Statics	1	2	0	2	0
Building Measurements	37	1	0	1	0
Elements of Architectural Form	28	1	0	1	0
History of Architecture	25	1	3	1	0
Technical English	122 (a)	1	0	1	0
French	264	2	0	2	0
Modelling	36	0	2	0	2
Freehand Drawing	35	0	2	0	2
Architectural Design	31	0	12	0	14
Engineering Drawing	167	0	4	0	4
Physical Training	280	0	2	0	2

ARCHITECTURE—SECOND YEAR

Subject	No.	Hours per week: First Term, Lect.	First Term, Studio	Second Term, Lect.	Second Term, Studio
Vacation Work	41	..	..	..	..
Descriptive Geometry	163	1	0	1	0
Mechanics of Materials	5	2	0	2	0
Theory of Architectural Planning	32	1	0	1	0
History of Architecture	25 (a)	1	0	1	0
History of Ornament	29	1	0	1	0
Economics & Finance	123	1	0	1	0
English	122 (b)	1	0	1	0
French	264	2	0	2	0
Photography	188	1	1½	0	1½
Modelling	36 (a)	0	2	0	2
Freehand Drawing and Water Color	35 (a)	0	2	0	2
Architectural Design	31 (a)	0	15	0	15
Engineering Drawing	171	0	3	0	3
Physical Training	280	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week: First Term, Lect.	First Term, Studio	Second Term, Lect.	Second Term, Studio
Vacation Work	42	..	..	..	..
Structural Design	8	1	3	1	3
History of Architecture	25 (b)	1	0	1	0
Architectural Composition	33	1	0	1	0
Garden Design	27	0	0	1	0
Commercial Law	124	1	0	1	0
French	264	1	0	1	0
Illumination	189	1	3	1	3
Public Speaking	133	1	0	0	0
Modelling	36 (b)	0	2	0	2
Freehand Drawing and Water Color Painting	35 (b)	0	2	0	2
Architectural Design	31 (b)	1	20	0	20

ARCHITECTURE—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work	43	..	..	..	..
Architectural Programmes	—	1	0	1	0
Garden Design	27 (a)	0	0	1	0
Structural Design	16	1	3	1	3
Acoustics	190	1	1½	1	0
History of Fine Art	30	1	0	1	0
Building Materials	38	2	0	2	0
Modelling from Life	36 (c)	0	2	0	2
Freehand Drawing from Life	35 (c)	0	2	0	2
Architectural Design	31 (c)	1	21½	1	20½

FIFTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Contracts and Specifications	127	0	0	1	0
Architectural Aspects of Town Planning	34	0	0	1	0
Professional Practice	—	1	0	1	0
Architectural Programmes (Advanced)	—	1	0	1	0
Structural Design	—	1	3	1	3
Heating and Ventilating	40	1	0	1	0
Sanitary Science	39	1	0	1	0
Architectural Design	31 (d)	2	28	2	28
or					
Architectural Engineering		2	28	2	28

6. DEPARTMENT OF CHEMICAL ENGINEERING

The course is designed to give the student a thorough training in Chemistry and its application to industry, as well as a general knowledge of the elements of thermodynamics, hydraulics, machine design, structural design, electricity and metallurgy. A preliminary training of this nature with subsequent practical experience will enable him to undertake the design and construction and also the operation and management of the plant required in such branches of chemical industry as are concerned with the production of chemical and pharmaceutical products, petroleum and its products, rubber goods, leather and glue, soap, meat products, food-stuffs, vegetable and animal oils, sugar, pulp and paper, illuminating gas, coal tar and wood distillates, paints and varnishes, explosives, dyes, glass, portland cement, metals and their alloys, electrochemical products, fermentation products, printers' inks, fertilizers, ceramic and building materials, etc.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Geometrical Optics	185(*b*)	1	2	1	2
Technical English	122(*a*)	1	0	1	0
German	265	2	0	2	0
Business	121	0	0	1	0
Mineralogy Laboratory	256	0	2	0	1
Biological Laboratory	80	0	6	0	0
Chemical Laboratory	86	0	0	0	12
Engineering Drawing	168	0	8	0	0
Physical Training	280	0	2	0	2

CHEMICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus..................	237	1	1	1	1
Mechanics of Materials....	4	2	0	2	0
Engineering Chemistry....	93	1	0	0	0
Organic Chemistry........	96	2	0	2	0
Metallurgy...............	241	0	0	1	0
Hydrostatics.............	186	0	0	1	1
Elementary Machine Design..................	232	1	0	1	0
Electricity...............	136, 137	2	3	2	3
Industrial Chemistry......	94	1	0	1	0
Physical Chemistry.......	98	2	0	2	0
Inorganic Chemistry......	87A	1	0	0	0
Inorganic Chemistry......	87B	0	0	1	0
German.................	265	1	0	1	0
Economics and Finance....	123	1	0	1	0
Chemical Laboratory......	92, 97	0	10	0	12
Engineering Drawing......	172	0	7	0	3
Physical Training.........	280	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry....	102	1	0	1	0
Theory of Structures......	7	2	0	0	0
Thermodynamics..........	217, 224	2	0	2	2
Hydraulics...............	205, 206	2	0	2	1
Metallurgy...............	243	1	0	1	0
Physical Metallurgy......	244	0	0	2	0
Assaying Laboratory......	49	0	3	0	0
Analytical Chemistry......	88	1	0	1	0
Electrochemistry..........	107, 108	2	3	0	0
Industrial Chemistry......	103	1	0	1	0
Organic Chemistry........	105	2	0	2	0
Chemical Plant...........	104	1	0	1	0
German.................	265	1	0	1	0
Commercial Law..........	124	1	0	1	0
Chemical Laboratory......	100, 106	0	7	0	17
Engineering Drawing......	177	0	6	0	0
Electrical Laboratory.....	144 (c)	0	0	0	3

CHEMICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285				
Industrial Management	130	1	0	1	0
Machine Design	234	1	0	1	3
German	265	1	0	1	0
or Spanish	266	1	0	1	0
Inorganic Chemistry	109	2	0	2	0
Organic Chemistry	110, 111	1	17	1	0
AND ONE OF:					
Electrochemistry	114, 115	2	*	2	*
Industrial Chemistry	112, 113	1	*	1	*
Sanitary and Forensic Chemistry and Bacteriology	116	1	*	1	*
Metallurgy	247	1	*	1	*
Physical Metallurgy	250	1	*	1	*
Ore Dressing	62, 63	1	0	1	6
Zymology	283	*	*	*	*

*All time not otherwise allotted must be spent in the various laboratories in the proportions assigned by the Department.

7 DEPARTMENT OF ELECTRICAL ENGINEERING

The course in electrical engineering is designed for those who are looking forward to work in connection with the design, manufacture, installation, or operation of electrical machinery and equipment for the generation, transmission, and utilization of power, for domestic and industrial purposes including its many applications to problems of intercommunication in connection with railway, telephone, telegraph, or radio equipment, to work in connection with electrochemical processes, and to administrative work in connection with both engineering and industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Illuminating Engineering	185 (*a*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	280	0	2	0	2

ELECTRICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	237	1	1	1	1
Descriptive Geometry	162	1	0	1	0
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Engineering Chemistry	93	1	0	0	0
Organic Chemistry	95	0	0	1	0
Inorganic Chemistry	87A	1	0	0	0
Hydrostatics	186	0	0	1	1½
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Steam Engines	216	1	0	1	0
Theory of Mechanism	230	2	1½	2	1½
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89	0	6	0	0
Engineering Drawing	170	0	12	0	12
Physical Training	280	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Thermodynamics	217, 219	2	3	2	1
Hydraulics	205, 206	2	0	2	1
Heat Engines	218	1	0	1	0
Mechanics of Machinery	231	1	0	1	0
Machine Design	233	2	4½	2	4½
Alternating Current	139	1	0	2	0
Physical Metallurgy	244	0	0	2	0
Electrochemistry	107, 108	2	3	0	0
Magnetism and Electricity	138	2	0	1	0
Electrical Design	141, 142	1	3	1	3
Commercial Law	124	1	0	1	0
Electrical Laboratory	140	0	6	0	6

ELECTRICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285				
Engineering Economics	125	0	0	1	0
Industrial Management	130	1	0	1	0
Applied Electricity	145, 146	4	20	4	19
AND ONE OF:					
Hydraulics	207, 208, 209	3	9	3	10
Thermodynamics	220, 221, 222	3	9	3	9
Electrochemistry	114, 115	2	9	2	9
Illumination Design	192	2	9	2	9
Radiotelegraphy	147, 148	2	9	2	9
and					
Acoustics	191(*a*)	1	1	0	0

8. DEPARTMENT OF METALLURGICAL ENGINEERING

This course is designed for those who intend to take up work in connection with the production, treatment and working of metals for the purposes of industry; or the design, construction, or operation of metallurgical plants including smelters, furnaces, foundries, refineries, and lixiviation works; and administrative work in connection with both Engineering and Industrial undertakings.

An optional course in this Department is provided in the Third and Fourth years for those students who wish to become Ceramic Engineers. Ceramic plant experience, approved by the Department, will be necessary before the student will be given his degree. Students who have successfully completed their first and second years in any department of engineering will be allowed to transfer to the Department of Metallurgical Engineering for pursuing this option.

FIRST YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Technical English	122(*a*)	1	0	1	0
Business	121	0	0	1	0
Mineralogy Laboratory	256	0	2	0	1
Engineering Drawing	166	0	11	0	18
Physical Training	280	0	2	0	2

METALLURGICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Chemistry	87A, 87B, 91	1	14	1	13
Metallurgy	241, 242	1	0	2	0
Geology and Ore Deposits	196	1	1	1	1
Steam Engines	216	1	0	0	0
Electricity	136, 137	2	3	2	3
Spanish	266	1	0	1	0
Economics and Finance	123	1	0	1	0
Engineering Drawing	172	0	3	0	6
Physical Training	280	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Cements and Concrete	11	0	0	1	0
Heat Engines	218	1	0	1	0
Electricity	143, 144(*d*)	1	3	1	3
Electrochemistry	107, 108	2	3	0	0
Assaying	45, 46	1	3	0	3
Ore Dressing	58, 59	1	3	1	3
Mining	51, 52	1	0	1	0
Metallurgy	245	2	3	1	6
Physical Metallurgy	246	1	3	1	0
Machine Design	234	1	0	1	3
Commercial Law	124	1	0	1	0
Chemical Laboratory	101	0	0	0	6
Engineering Drawing	182	0	3	0	0
Analytical Chemistry	88	1	0	1	0

METALLURGICAL ENGINEERING—THIRD YEAR

(*a*) Ceramic Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Physical Chemistry	98	2	0	2	0
Engineering Geology	197	1	0	1	0
Theory of Structures	7	2	0	0	0
Cements and Concrete	11	0	0	1	0
Commercial Law	124	1	0	1	0
Engineering Drawing	177	0	6	0	6
Thermodynamics	223, 224	1	0	1	2
Machine Design	234	1	0	1	0
Mineralogy	255, 258	2	1	0	0
Petrography	260	1	0	1	0
Ceramics (General and Manufacturing)	254(*a*)	4	0	2	0
Glazes	254(*b*)	0	0	2	0
Ceramic Calculations	254(*c*)	0	0	1	0
Ceramic Laboratory	254(*d*)	0	6	0	6
Clay Testing	254(*e*)	0	6	0	6

FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	6	0	6
Engineering Economics	125	0	0	1	0
Contracts and Specifications	127	0	0	1	0
Plant Management	129	0	0	1	0
Thermodynamics	223	1	0	1	0
Assaying	47, 48	0	0	1	3
Ore Dressing	60, 61	1	6	1	0
Electrochemistry	114, 115	2	3	2	3
Metallurgy	249	1	0	1	0
Metallurgy Problems	248	2	4	2	4
Physical Metallurgy	250	1	3	1	3
Thermodynamic Laboratory	224	0	3	0	0
Hydraulic Laboratory	210	0	0	0	3

METALLURGICAL ENGINEERING—FOURTH YEAR

(*a*) Ceramic Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Contracts and Specifications	127	0	0	1	0
Plant Management	129	0	0	1	0
Reinforced Concrete	15	1	0	1	0
Structural Design	18	1	0	0	0
Silicate Chemistry	116(*a*)	2	0	0	0
Pleistocene Geology	194, 201	1	3	1	0
Petrography	262, 263	1	2	1	2
Structural Design Drawing	183	0	6	0	6
Refractories and Ceramic bodies	254(*f*)	2	0	0	0
Glass and enameled iron	254(*g*)	0	0	2	0
Ceramic products and specifications	254(*h*)	0	0	1	0
Ceramic Laboratory	254(*i*)	0	9	0	9
Thesis	285	0	10	0	10

OUTLINE OF LECTURE AND LABORATORY COURSES PROCEEDING TO BACHELOR DEGREES

On the following pages the courses of instruction are set forth in detail. The time devoted to the various subjects, both for lectures and practical work, is indicated as accurately as possible; the hours, however, shown in the prescriptive schedules on pages 44 to 68 will govern.

The curriculum as printed is intended to cover the prescription for the current year only and does not imply the right of a student to have the course unchanged during any subsequent year of his attendance.

The courses are designed to give the student a sound training in the fundamental scientific principles on which the various branches of engineering are based. The instruction is given by means of lectures and practical work in the laboratories, the drafting rooms and the field.

The courses in the first two years are devoted to the theoretical and essential scientific requirements of the engineering profession as a whole, with an introduction in a few cases of the practical application of these to engineering problems.

In the third and fourth years, the subjects of the former years are continued with particular attention paid to their application to modern engineering practice in the problems of design, erection, installation and operation peculiar to the several branches of the profession.

APPLIED MECHANICS

1. *Statics:*—T. R. Loudon.
   All Departments, I Year; 2 hours per week, both terms.
   This course of lectures deals with forces in a single plane, and concerns chiefly the calculation of tension, compression and shearing stresses in frame structures and solid beams.

2. *Dynamics:*—T. R. Loudon.
   Departments 1, 2, 3, 6, 7, 8, I Year; 2 hours per week; both terms.
   This is an elementary course of lectures on particle dynamics which is extended toward the latter half of the Session to cover the consideration of practical examples of actual bodies in motion.
   Texts:—Tutorial Dynamics—Briggs & Bryan; Analytical Mechanics for Engineers—Seeley and Ensign.

3. *Dynamics of Rotation:*—W. J. Loudon.
   Departments 1, 3, 7, 8, II Year; 1 hour per week; both terms.
   This course covers angular motion, including moments of inertia, simple harmonic motion, the pendulum, centres of mass, suspension and percussion, the simple theory of the fly-wheel and the governor.
   Text Book:—Dynamics of Rotation—Loudon.

4. *Mechanics of Materials:*—P. Gillespie.

Departments 1, 2, 3, 6, 7, 8, II Year; 2 hours per week; both terms.

In this course the strength and elasticity of materials are mathematically treated. The stresses in such elements of structures as the tie rod, the beam, the strut and the member subjected to shear are investigated and the elementary principles of design established. In the lecture and drafting rooms through numerous problems involving the design of simple beams, columns, riveted connections, etc., these principles are exemplified. The work includes also the discussion of eccentric loading, suddenly applied loads and repeated stresses.

Reference Book:—Mechanics of Materials—Merriman.

5. *Mechanics of Materials:*—T. R. Loudon.

Department 4, II Year; 2 hours per week; both terms.

This course deals with the mathematical consideration of stress and elasticity. Among the problems taken up are the consideration of riveted joints, theory of simple and continuous beams, the theory of columns and simple column footings.

Text:—Strength of Materials—Boyd.

6. *Theory of Structures:*—C. R. Young.

Department 1, III Year; 2 hours per week; both terms.

The work of the first term comprises a discussion of moving loads, combined stresses, columns, restrained, continuous and trussed beams, multiple section and box girders, and plate girders. A number of designs of structures and structural details are worked out in the class and drafting rooms.

The second term is given chiefly to the design of a riveted truss highway span and a riveted truss railway span, designs for these structures being made in the lecture and drafting rooms.

Text Books:—Modern Framed Structures, Part III—Johnson, Bryan and Turneaure; Structural Members and Connections—Hool and Kinne; Structural Problems—Young; Carnegie Pocket Companion; Cambria Steel.

7. *Theory of Structures:*—C. R. Young.

Departments 2, 3, 3(*a*), 6 and 8(*a*), III Year; 2 hours per week; first term

The work is practically the same as that for Department I in the first term.

8. *Structural Design:*—T. R. Loudon, W. J. T. Wright.

Department 4, III Year; 2 hours per week; both terms.

During the first term, the economics of the design of floor systems in timber and structural steel are discussed. The design of masonry piers, structural steel and timber columns is also gone into in the first term.

The second term is taken up in the discussion of the design of roof trusses and an introduction to reinforced concrete.

9. *Mechanics of Materials:*—P. Gillespie.

Department 1, III Year; Department 3, II Year; Department 2, IV Year; 3 hours per week; one term.

This laboratory course is intended to give the student an introduction to the experimental study of the strength and elasticity of materials. It is intended that he shall acquire some familiarity with the construction and operation of testing machines and with the properties of ordinary materials of construction.

Reference:—Laboratory Instruction Sheets, Department of Civil Engineering; Municipal and Structural.

10. *Stress Graphics:*—T. R. Loudon.

Department 1, III Year; one hour per week; both terms.

This course of lectures deals mainly with graphic methods of solving stresses in framed structures. The construction of Shearing Force diagrams, Bending Moment diagrams and Influence Lines is also dealt with.

Text Book:—Graphic Analysis—Wolfe.

10(*a*). *Compound Stress:*—T. R. Loudon.

Department 3, II Year; one hour per week, second term.

This course deals mainly with the discussion of methods determining the stress conditions in bodies subjected to compound stress. Both analytical and graphical methods of analysis are discussed.

11. *Cements and Concrete:*—P. Gillespie.

Departments, 1, 8, and 8 (a) III Year; one hour per week; second term.

The manufacture, testing and use of Portland cement and the fundamentals of the theory of reinforced concrete are discussed in this course of lectures.

12. *Theory of Structures:*—C. R. Young.

Departments 1(c), (d), (e), and 3(a), IV Year; 2 hours per week; both terms.

The work comprised in this course of lectures concerns arches, suspension bridges, cantilever bridges, swing bridges, deflections, and secondary stresses. Problems based on the lectures are worked out in the drafting rooms.

Reference Books:—Modern Framed Structures, Part II—Johnson, Bryan and Turneaure; Theory of Structures—Spofford.

13. *Mechanics of Materials:*—P. Gillespie.

Departments 1 (c), (d) and (e), IV Year; a laboratory course of 3 hours per week one term and 6 hours per week the other term.

This course of experiments is intended to give the student practice in investigating the elastic and physical properties of iron, steel, concrete, timber, etc., and in the use of instruments of precision designed for that purpose.

Reference Book:—Materials of Construction—Johnson.

14. *Foundations, Retaining Walls and Dams:*—P. Gillespie, W. J. Smither.

Department 1 (b), (c), (d) and (e), IV Year; 1 hour per week; both terms.

This course of lectures is devoted to the design of the structures mentioned. Preparatory to the discussion of the practical aspects of the subjects, and in order to gain familiarity with the fundamental principles involved, a part of the first term is given over to the consideration of the theory of compound stress. The most approved forms of construction of retaining walls, footings, abutments, piers and dams are then described, and typical designs are worked out in the class and drafting rooms.

Some attention is also given to the principles of formula charting.

Text Books and Books of Reference:—Retaining Walls for Earth—M. A. Howe; Walls, Bins and Grain Elevators—M. S. Ketchum; A Treatise on Masonry Construction—I. O. Baker; Design and Construction of Dams—E. Wegmann.

15. *Reinforced Concrete:*—P. Gillespie.

Department 1 (b), (c), (d) and (e); and Department 8 (a), IV Year; 1 hour per week; both terms. Department 3, IV Year; 1 hour per week; first term.

The theory of the strength of reinforced concrete elements including the beam, the slab, the T-beam, the column and the footing, is continued in this course.

The analysis of the monolithic arch by the elastic theory is discussed, and the student is required in the drafting room to apply his knowledge to the design of simple structures.

Reference books:—Principles of Reinforced Concrete Construction—Turneaure and Maurer; Reinforced Concrete Construction, Vol. I—Hool.

16. *Structural Design:*—T. R. Loudon.

Department 4, IV Year; 1 hour lecture and 3 hours laboratory per week; both terms.

During this course of lectures, the economics of the design of buildings in reinforced concrete and steel are discussed. This course

of lectures is supplemented by the actual designing of buildings in the drafting room.

Text:—Principles of Reinforced Concrete—Turneaure and Maurer.

17. *Structural Design:*—C. R. Young, W. J. Smither.

Department 1_c, 1_d, IV Year; 1 hour per week; both terms.

Department 1_b and 3, IV Year; 1 hour per week; first term.

This course of lectures is devoted to the problems connected with the structural design of buildings of timber, steel and reinforced concrete. The various structural elements such as the floors, columns, footings, walls and wind bracing, are fully discussed, and portions of typical buildings are designed in the class and drafting rooms.

Text Books:—Handbook of Building Construction—Hool and Johnson; Architects' and Builders' Handbook—Kidder—Nolan.

18. *Structural Design:*—C. R. Young, W. J. Smither.

Departments 1_c, 1_d, 3 and 8 (a), IV Year; 1 hour per week; first term.

Consideration is given in this course to the various types of mill buildings, to the conditions governing their choice and to the details of construction in different materials. Designs of portions of mill buildings are worked out in the class and drafting rooms.

Text Books:—Steel Mill Buildings—Ketchum. Mill Buildings—Tyrrell.

19. *Miscellaneous Structures:*—W. J. Smither.

Department 1 (b), (c), (d) and (e), IV Year; 1 hour per week; second term.

In this course of lectures the application of theoretical principles to the design of a variety of structures is made. Among those structures discussed are transmission line towers, elevated tanks and their supporting towers, standpipes, large pressure pipes, sewers, culverts, small highway bridges, sub-surface tanks and tall chimneys. Whenever possible the lecture work is followed up by designs in the drafting room.

20. *Railway Structures:*—C. R. Young.

Department 1_e, IV Year; 1 hour per week; first term.

A course of lectures with exercises covering alternative bridge layouts with comparative estimates of costs, temporary and permanent trestles, tunnels, tunnels vs. bridges, buildings, turntables, snow sheds and shelters.

ARCHITECTURE

25. *History of Architecture:*—H. H. Madill, E. R. Arthur.

Department 4, I Year; 1 hour per week; both terms.

In this course the development of architecture is traced from Prehistoric times to the Early Romanesque.

25a. *History of Architecture:*—H. H. Madill, E. R. Arthur.
Department 4, II Year; 1 hour per week; both terms.
In this course the development of architecture is traced from the Romanesque Period to the present time.

25b. *History of Architecture:*—H. H. Madill, E. R. Arthur.
Department 4, III Year; 1 hour per week; both terms.
In this course the work of the Renaissance in Italy, France and England is taken in greater detail than was possible in the broad field covered in the previous year.

26. *Advanced Architectural Programmes:*—H. H. Madill, E. R. Arthur.
Department 4, IV Year; 1 hour per week; both terms.
In this course of lectures the principles underlying the planning of such large buildings as Churches, Departmental Stores, Theatres, Schools, Railway Stations, etc., are discussed in detail.

27. *Garden Design:*—H. B. Dunington-Grubb.
Department 4, III Year.
In this course the historical development of Garden Design is traced from earliest times; the study of sites; the influence of topography, orientation, access, etc., on the problems of design; site planning; the location of buildings; the solution of an actual problem on a typical site.

27a. *Garden Design:*—H. B. Dunington-Grubb.
Department 4; IV Year.
The work of the previous year is continued and a problem is set in the studio involving principles of both architectural and garden design.

28. *Elements of Architectural Form:*—E. R. Arthur.
Department 4, I Year; 1 hour per week; both terms.
Lectures on the Five Orders of Architecture, their affiliated forms and other elements used in design. This course is preliminary to the lectures given in the II Year on the Theory of Architectural Planning.

29. *Architectural Ornament:*—H. H. Madill.
Department 4, II Year; 1 hour per week; both terms.
In this course the development of Ornament is traced from the beginning through Egyptian, Assyrian, Grecian, Roman, Byzantine, Romanesque, Gothic and Renaissance styles. An attempt is made to analyze ornament of the best periods and to systematize the principles followed in form and colour.

30. *History of Fine Art:*—C. W. Jefferys, F. Coates.
Department 4, IV Year; 1 hour per week; both terms.
The course consists of an outline of the history and development of painting and of the minor pictorial arts from the earliest time

until the present day; followed by an outline of the history and development of the different eras of sculpture ranging from the primitive to the present day.

31. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, I Year.
This comprises work done in the Studio, including lettering, the drawing and rendering of the Orders and such elementary motives as a door, a window, etc.
This is followed by a drawing in which the Classic orders and ornament taken from a particular building are arranged in the form of a composition, and by an elementary problem in design.

31*a*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, II Year.
This course is given by means of individual instruction in the studio and by criticisms of the solutions of different problems set during the year. It is in this course that the student begins the serious study of design; continued practice in architectural drawing and rendering affords the training necessary to make of the student a proficient draughtsman.

81*b*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, III Year.
This course is given by individual instruction in the studio and by criticisms of solutions of problems set during the year. The greater part of the course is devoted to problems in design and forms a continuation of the course given in the preceding year.

31*c*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
Department 4, IV Year.
This course is a continuation of the work of the preceding years, being given by individual instruction in the studio and criticisms of the solution of problems set during the year.
During the second term architectural working drawings of a building designed by the student are prepared in the studio.

31*d*. *Architectural Design:*—T. R. Loudon, H. H. Madill, E. R. Arthur.
Department 4, V Year; Architectural Engineering Option.
In this course the design and preparation of working drawings and structural details of work of a monumental character is carried on in the studio.

32. *Theory of Architectural Planning:*—E. R. Arthur.
Department 4, II Year.
In this course special attention is given to the elements and genera principles of architectural planning.

33. *Architectural Composition:*—E. R. Arthur.
Department 4, III Year.
This course consists of a series of lectures on the theory of architectural design, the analysis of composition, proportion, scale, etc.

34. *Architectural Aspects of Town Planning:*—E. R. Arthur.
Department 4, V Year; 1 hour per week; second term.
In this course of lectures the Historical Development of Town Planning is traced with particular reference to the Axial Planning of the Renaissance, Public Squares, the Grouping of Buildings and the placing of Monuments.

35. *Freehand Drawing and Water Colour Painting:*—C. W. Jefferys.
Department 4, I Year; 3 hours per week; both terms.
Drawing from still life objects. Primary free hand perspective. Primary pencil, charcoal, and pen and ink rendering.

35*a*. Department 4, II Year; 3 hours per week; both terms.
Drawing and monochrome painting from still life.
Drawing from the cast.
Pencil, pen and ink, and monochrome rendering.
Primary water colour.
Drawing from landscape and natural objects.

35*b*. Department 4, III Year; 3 hours per week; both terms.
Drawing from the cast.
Water colour from still life. Water colour rendering.
Drawing from landscape and natural objects.
Students who are sufficiently advanced are admitted to the Fourth Year Life Drawing Class.

35*c*. Department 4, IV Year; 3 hours per week; both terms.
Water colour from still life and from landscape.
Drawing from life.
Water colour rendering.

36. *Modelling:*—Frederick Coates.
Department 4, I Year; 2 hours per week; both terms.
The Orders. Synopsis of styles.

36*a*. Department 4, II Year; 2 hours per week; both terms.
Problems in figures and in relation to architecture.

36*b*. Department 4, III Year; 2 hours per week; both terms.
Styles continued.
Problems, combination of figure, ornament and architecture and their relative values.

36c. Department 4, IV Year; 2 hours per week; both terms.
Modelling from life.
Anatomy.
Composition of groups.

37. *Building Measurement:*—C. H. C. Wright.
Department 4, 1 Year; 1 hour per week; both terms.
In this course of lectures the principles of measurements and mensuration with special reference to buildings will be discussed. With this is combined practice in measurements of existing buildings, quantities, etc.

38. *Building Materials:*—C. H. C. Wright.
Department 4, IV Year; 2 hours per week; both terms.
The structural and aesthetic value of the various building materials.

39. *Sanitary Science:*—H. H. Madill.
Department 4, V Year; 1 hour per week; both terms.
Modern plumbing, its design and installation, drainage, sewerage disposal and water supply.

40. *Heating and Ventilating:*—C. H. C. Wright.
Department 4, V Year; 1 hour per week; both terms.
The design of different systems, where they should be used, heating specifications, etc.

41. *Vacation Work:*—H. H. Madill.
Department 4, II Year.
Each student will be required to submit a set of twenty pages of notes on building construction on or before the opening day of the session. These notes are to consist of freehand pencil drawings with figured dimensions. Instruction as to the nature of these notes will be given by Professor H. H. Madill before the close of the previous session.

42. *Vacation Work:*—E. R. Arthur.
Department 4, III Year.
Each student is required to submit a set of rendered measured drawings of existing buildings or portions of buildings, the building first to be approved by Prof. Arthur, who will also decide the number and size of the drawings to be made. The record of measurements must be preserved in a notebook which will be submitted with the final drawings.

43. *Vacation Work:*—C. H. C. Wright, C. W. Jefferys.
Department 4, IV Year.
Each student is required to submit a set of at least six outdoor sketches in water colour, pen and ink, or pencil. The minimum size for each sheet will be $9'' \times 12''$. Of these sketches at least two will be in water colour and three will be of an architectural character.

ASSAYING, MINING AND ORE DRESSING

The work in Mining is directed more to the development of the proper attitude of mind towards mining problems than to the teaching of actual mining methods.

The teaching of Assaying has a two-fold function. The first is to give the student a working knowledge of the practice of the art, so that he can earn money as an assayer on graduation and use this as a stepping-stone to other positions. The second is to use the assaying laboratories for the training of the students in certain important phases of Engineering methods. The size of the apparatus, the completeness of the processes in short intervals of time, the extreme accuracy of results when so desired, the relation of the extent of error to time and method, the similarity of the academic laboratory to the field laboratory, all these permit an unrivalled opportunity for driving home much broad Engineering philosophy. The assaying processes and apparatus lend themselves peculiarly well for the development of a proper perspective in regard to errors and accuracy in measurements.

The study of Ore Dressing, when accompanied by laboratory work in a well equipped ore dressing laboratory, is one of the most important of the Mining Engineering subjects. Not only is the mechanical treatment of ores a very important branch of Mining Engineering, but the mental processes involved in a study of the fundamental principles underlying the art and the compromise necessary for field practice form one of the best fields for the development of Engineering philosophy. From these points of view the ore dressing laboratory is exceptionally well equipped.

45. *Assaying:*—J. T. King.

Departments 2 and 8, III Year; 1 hour per week; first term.

A first course of lectures on the theory of fire assaying. Emphasis is laid not only on the chemical and metallurgical principles involved, but upon the errors inherent in operators as well as in methods.

Text Book:—Manual of Fire Assaying—Fulton.

46. *Assaying:*—J. T. King.

Departments 2 and 8, III Year; 3 hours per week; both terms.

A laboratory course in the determination of the precious metals in ores, milling and metallurgical products. Scorification and crucible assays of ores and products, pure and impure, fluxes, slags and solutions. Buckboard practice, ores with metallics. Copper and lead by electrolysis. Students are expected to do their later assays with despatch and a reasonable degree of accuracy. Neatness of work is required.

47. *Assaying:*—J. T. King.
Departments 2 and 8, IV Year; 1 hour lecture per week; second term.
A continuation of course 45. Complex ores. Combination assays. The sampling and assay of bullion. The Platinum group metals. Checks and corrections.

48. *Assaying:*—J. T. King.
Departments 2 and 8, IV Year; 3 hours per week; second term.
An advanced laboratory course in which some of the methods of course 47 are used.

49. *Assaying:*—J. T. King.
Department 6, III Year; 3 hours per week; first term.
An introductory laboratory course for Chemical Engineers. Some lecture instruction is given. An abbreviation of courses 45 and 46.

50. *Mining:*—H. E. T. Haultain and F. C. Dyer.
Department 2, I Year; 3 hours per week; second term.
A laboratory course, including some lectures, being an introduction to certain mining and milling machinery and methods.

51. *Mining:*—H. E. T. Haultain.
Department 2, II Year and Department 8, III Year; 1 hour per week; first term.
An introductory course of lectures.

52. *Mining:*—H. E. T. Haultain.
Department 8, III Year; 1 hour per week; second term.
An extension of No. 51.

53. *Mining:*—F. C. Dyer.
Department 2, II Year; 3 hours per week; first term.
Continuation of No. 50. Rock drills, sampling methods, use of explosives.

54. *Mining:*—H. E. T. Haultain and F. C. Dyer.
Department 2, III Year; 1 hour per week; both terms.
Principles of mining.

55. *Mining:*—H. E. T. Haultain.
Department 2, IV Year; 1 hour per week; both terms.
Special problems, estimates, reports.

56. *Mine Cost Keeping and Management:*—H. E. T. Haultain.
Department 2, IV Year; 1 hour per week; both terms.
One of the fundamental features that must not be lost sight of by the Mining Engineer is, that his work is designed primarily for purposes of financial profit. This course of lectures deals with details from this point of view. The total cost of a ton of ore requiring as it does an understanding of the problems of amortization, is first dealt with in a broad way. Then are considered various problems of cost keeping, leading on to problems of

time and motion study which are essential to the development of the fine points of the art in any particular mining problem. The latter part of the course deals with problems of management, the relations of members of the staff to each other, and the relations of the staff to labour.

58. *Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Departments 2 and 8, III Year; 1 hour per week; both terms.
The general principles of Ore dressing.

59. *Ore Dressing:*—F. C. Dyer.
Departments 2 and 8, III Year; 3 hours per week; both terms.
Work with crushing machinery, principles of crushing and grading, screen analyses, concentration with gravity separation apparatus, etc.

60. *Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Departments 2 and 8, IV Year; 1 hour per week; both terms.
No. 58 continued, study of flow sheets and special problems.

61. *Ore Dressing:*—F. C. Dyer.
Departments 2 and 8, IV Year; 6 continuous hours per week; first term.
Advanced work with ore dressing appliances, ore testing and check mill runs.

62. *Ore Dressing:*—F. C. Dyer.
Department 6*k*, IV Year; 1 hour per week; both terms.
General principles of ore dressing.

63. *Ore Dressing:*—F. C. Dyer.
Department 6*k*, IV Year; 1 period of 6 hours per week; second term.
Principles of sampling, crushing and grading, screen analyses, concentration with gravity separation apparatus, flotation, ore testing, etc.

64. *Physics of Ore Dressing:*—H. E. T. Haultain and F. C. Dyer.
Department 2, III Year; 1 hour per week; both terms.
Ore dressing methods involve a study of the laws governing the phenomena of surface tension, capillarity and colloidal solutions, in addition to those of hydrostatics and certain phases of hydraulics. This is embodied in a special course of lectures in conjunction with laboratory work in the Ore dressing laboratory.

65. *Theory of Measurement:*—H. E. T. Haultain.
Department 2, II Year; 1 hour per week; first term.
This title is not an entirely suitable one for this course of lectures because it is generally applied to a study of the philosophy of extremely accurate measurements. The Mining Engineer has to continually make satisfactory use of measurements with a

wide range of inaccuracy. This course of lectures deals with the philosophy underlying the causes of these errors and the practical application of such approximations. The opportunity is taken in these lectures to deal with the subject of illustrating measurements by graphs.

66. *Introductory Research:*—H. E. T. Haultain and F. C. Dyer.

Department 2, III Year; 3 hours per week; second term.

This is a laboratory course including some lectures and is a preparation for the thesis of the fourth year.

67. *Thesis.*

Department 2, IV Year; 7 hours per week; first term; 10 hours per week, second term, in continuous periods.

Thesis in this department consists mainly in reports on original work done in the laboratories. In the III year the subject "Introductory Research" paves the way for the thesis. During the month of October the student decides on the subject of his thesis in consultation with his professors. After this is decided the student uses his own initiative in the development of his work.

The thesis is divided into three parts. The first part, which is handed in during the first week in November, contains the title, a statement of what the title is meant to convey and an outline of the work that is proposed to be done. The second part is handed in during the first week of January and contains a report of progress to date and enables the professor in charge to keep in closer touch with the work. The third and final part is handed in a week before the examinations and is a report of progress to date with final conclusions. The three parts combined constitute the thesis.

68. *Vacation Work:*—W. A. Parks.

Department 2, II Year.

From students in Department 2, who have been actually engaged during the summer with Government or other approved geological survey parties, geological field notes will be accepted in lieu of construction notes.

69. *Vacation Work:*—H. E. T. Haultain.

Department 2, III Year.

This is a series of letters written during the summer vacation, dealing with various aspects of a mining engineer's work. These are intended to direct and help the student's powers of observation, analysis and criticism as well as being exercises in the art of lucid technical expression.

Four letters are to be written and mailed to the Professor of Mining Engineering, one each month, June, July, August, and September; at least one letter must deal with a labour episode.

70. *Vacation Work:*—H. E. T. Haultain.

Department 2, IV Year.

The student may select either one of the following alternatives:

A. Four letters to be written and mailed, one each month, June, July, August, and September; at least one letter to be on a labour episode: or

B. One letter describing a labour episode to be written and mailed to the Professor of Mining Engineering not later than June 30th, and an article of suitable character and length for submitting to the Engineering Institute of Canada or the Canadian Mining Institute as a student's paper, to be written and mailed to the Professor of Mining Engineering not later than September 30th.

ASTRONOMY AND GEODESY

71. *Astronomy, Elementary:*—R. K. Young.

Department 1, II Year; 1 hour per week, both terms.

A course in descriptive Astronomy, explaining the ordinary astronomical terms, and describing the various celestial bodies and their motions. In the evenings opportunity will be given for identifying the stars and for observing with telescopes.

Text book:—Fath, Elements of Astronomy.

72. *Astronomy and Geodesy:*—L. B. Stewart.

Department 1, III Year; 2 hours per week; both terms.

The course of lectures deals with the determination of time, latitude, longitude and azimuth, by methods adapted to the use of the surveyor's transit and the sextant. It is designed to fulfil the requirements of the final examinations for Ontario and Dominion Land Surveyors.

In Geodesy an account is given of the principles and methods of a secondary triangulation survey, also of the principles involved in the North-West system of survey.

Text books:—Practical Astronomy as applied to Geodesy and Navigation—Doolittle, Notes on Practical Astronomy and Geodesy, Nautical Almanac, 1929.

73. *Field Work:*—L. B. Stewart, S. R. Crerar.

Department 1, III Year; about 2 hours per week, first term.

The practical work in this subject comprises observations in the field with the transit and sextant for the determination of time, latitude and azimuth by the methods described in the lectures.

74. *Astronomy (Advanced)*:—L. B. Stewart.

Department 1a, IV Year; 2 hours per week; both terms.

The lecture course in this subject comprises the theory and adjustment of the instruments used in connection with a geodetic survey; the methods of taking and reducing observations for time, longitude, latitude, and azimuth, with the precision required on such a survey; and other matters relating to these subjects.

75. *Geodesy and Metrology*:—L. B. Stewart.

Department 1a, IV Year; 2 hours per week; both terms.

The lecture course includes a description of the methods of measuring base lines and the angles of a triangulation; the geometry of the spheroid with applications to geodetic problems; the computation of geodetic positions; the solution of large triangles on the earth's surface, and the adjustment of a triangulation; trigonometric and precise spirit levelling; the determination of the figure of the earth by arc measurements, and by the pendulum; the theory of map projections, etc.

76. *Astronomy, Geodesy and Metrology*:—L. B. Stewart.

Department 1a, IV Year; about 23 hours per week; both terms.

The practical work in the above subjects includes the observation of meridian transits for time and longitude determinations, and of prime vertical transits for latitude, with the astronomical transit instrument; the observation of meridian zenith distances of stars, and of azimuths at elongation for latitude, with the alt-azimuth; theodolite observations for azimuth; observations for latitude with the zenith telescope; the investigation of the constants of the instruments used, and the reduction of all observations; the measurement of a base line with the steel tape and with invar wires, and the determination of the constants of the tape; the measurement of the angles of a triangulation and the adjustment of the angles of network of triangles, etc. A portion of this work will be taken at the Summer Survey Camp. (See page 37.)

BIOLOGY

80. *Elementary Biology*;—G. H. Duff.

Department 6, I Year; 6 hours per week, first term.

An elementary laboratory course on the nature and identification of plant and animal tissues and products, with microscope practice.

81. *Elementary Biology*:—J. W. MacArthur.

Department 1b, IV Year.

A special course of Lectures, Laboratory work and demonstrations, dealing particularly with organisms of fresh water and sewage;

their identification, classification, distribution, life histories, sanitary importance and control.

Text book:—Whipple –Microscopy of Drinking Water, 4th ed. (1927).

82. *Hygiene and Bacteriology:*—D. T. Fraser and R. R. McClenahan.

Department 1_b, IV Year.

(1) This is a course of twenty-five lectures, dealing with the principles of Hygiene and Sanitary Science and including a discussion of the facts in Bacteriology which are necessary for a proper understanding of Hygiene and Sanitary Science. The particular phases of the subject which are of importance from the standpoint of Sanitary Engineering are dealt with.

(2) This is a laboratory course of six hours per week, second term, dealing especially with the Bacteriology of water, milk and sewage.

CHEMISTRY

85. *General Chemistry:*—E. G. R. Ardagh.

Departments 1, 2, 3, 6, 7, 8, I Year; 2 hours per week, first term; 1 hour per week, second term.

A lecture course in general chemistry, with experimental illustrations.

86. *Inorganic Chemistry:*—L. J. Rogers.

Department 6, I Year; 12 hours per week, second term.

A laboratory course of quantitative experiments illustrating the use of the sensitive balance, and confirming the fundamental laws of chemistry; qualitative inorganic analysis; quantitative analysis of pure salts.

Text books:—Analytical Chemistry, Vol. II—Treadwell-Hall; Qualitative Chemical Analysis—A. A. Noyes.

87A. *Inorganic Chemistry A:*—E. G. R. Ardagh.

Departments 1, 2, 3, 6, 7 and 8, II Year; 1 hour per week, first term.

A continuation of Course 85 dealing especially with the metals.

87B. *Inorganic Chemistry B:*—E. G. R. Ardagh.

Departments 2, 6 and 8, II Year; 1 hour per week, second term.

A lecture course on theoretical chemistry with special reference to the metals; a continuation of Course 85.

Text book:— Smith's College Chemistry—Kendall.

88. *Analytical Chemistry:*—L. J. Rogers.

Departments 2, 6 and 8, III Year; 1 hour per week, both terms.

A lecture course on the principles of chemical analysis; select gravimetric and volumetric methods; technical analysis.

89. *Analytical Chemistry;*—E. A. Smith.
Departments 1, 2 and 3, II Year; 6 hours per week, second term; Dept. 7, II Year; 6 hours per week, first term.
Laboratory course in qualitative and quantitative analysis.

90. *Analytical Chemistry:*—J. W. Bain.
Department 2, II Year; 6 hours per week, one term.
A laboratory course in the gravimetric determination of metals and acids, with elementary volumetric analysis.

91. *Analytical Chemistry:*—L. J. Rogers.
Department 8, II Year; about 14 hours per week, first term; about 13 hours per week, second term.
A laboratory course comprising gravimetric and volumetric methods, acidimetry and alkalimetry.
Text books:—Analytical Chemistry, Vol. II—Treadwell-Hall; Qualitative Chemical Analysis—A. A. Noyes.

92. *Analytical Chemistry:*—L. J. Rogers.
Department 6, II Year; 180 hours.
A laboratory course in quantitative chemical analysis; inorganic preparations.
Text book:—Analytical Chemistry, Vol. II—Treadwell-Hall.

93. *Engineering Chemistry:*—J. W. Bain.
Departments 1, 3, 6 and 7, II Year; 1 hour per week, first term.
A lecture course consisting of a study of the industrial production and application of heat, and of the chemistry of fuel and the products of combustion.

94. *Industrial Chemistry:*—J. W. Bain.
Department 6, II Year; 1 hour per week, both terms.
A lecture course on the manufacture of salts, acids, alkalies and inorganic chemicals.

95. *Organic Chemistry:*—M. C. Boswell.
Departments 1, 3 and 7, II Year; 1 hour per week, second term.
A lecture course in elementary organic chemistry.

96. *Organic Chemistry:*—M. C. Boswell.
Department 6, II Year; 2 hours per week, both terms.
A lecture course dealing with the aliphatic compounds.

97. *Organic Chemistry:*—M. C. Boswell.
Department 6, II Year; 60 hours, second term.
A laboratory course in organic preparations.

98. *Physical Chemistry:*—F. B. Kenrick.
Departments 6, II Year and Department 8 (a), III Year; 2 hours per week, both terms.
A course of lectures on the elements of chemical mechanics, and the theory of solutions.

99. *Analytical Chemistry:*—L. J. Rogers.
Department 2, III Year; 9 hours per week, second term.
A laboratory course on the technical analysis of ores and furnace products.

100. *Industrial Chemistry:*—E. G. R. Ardagh.
Department 6, III Year; about 7 hours per week, first term, 17 hours per week, second term.
A laboratory course in industrial chemistry.

101. *Analytical Chemistry and Phase Rule:*—L. J. Rogers, J. T. Burt-Gerrans.
Department 8, III Year; about 6 hours per week, second term.
A laboratory course in analysis and phase rule.

102. *Engineering Chemistry:*—J. W. Bain, E. G. R. Ardagh.
Departments 1, 2, 3, 3(a), 6, 7, 8 and 8(a), III Year; 1 hour per week, both terms.
A lecture course on the application of chemistry to engineering problems; air, water, the materials of construction, explosives, etc.

103. *Industrial Chemistry:*—E. G. R. Ardagh.
Department 6, III Year; 1 hour per week, both terms.
A lecture course on petroleum and its products, coal tar and its products; fats, oils, soap, sugar, starch, gums, rubber; fermentation industries, etc.

104. *Chemical Plant:*—J. W. Bain.
Department 6, III Year; 1 hour per week, both terms.
A lecture course on the machinery and plant used in chemical manufacturing.

105. *Organic Chemistry:*—M. C. Boswell.
Department 6, III Year; 2 hours per week, both terms.
A lecture course on the aromatic series.

106. *Organic Chemistry:*—M. C. Boswell.
Department 6, III Year; 85 hours.
A laboratory course in organic preparations in the aromatic series.

107. *Electrochemistry:*—W. L. Miller.
Departments 6, 7 and 8, III Year; 2 hours per week, first term.
A lecture course on elementary electrochemistry, illustrated by experiments.

108. *Electrochemistry:*—W. L. Miller and J. T. Burt-Gerrans.
Departments 6, 7 and 8, III Year; 3 hours per week, first term.
A laboratory course in quantitative measurements to accompany Course 107.

109. *Inorganic Chemistry:*—J. W. Bain.
Department 6, IV Year; 2 hours per week, both terms.
A lecture course on chemical theory.

110. *Organic Chemistry:*—M. C. Boswell.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on advanced organic chemistry.

111. *Organic Chemistry:*—M. C. Boswell.
Department 6, IV Year.
A laboratory course in advanced organic chemistry; about seventeen hours first term.

112. *Industrial Chemistry:*—J. W. Bain.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on selected subjects in chemical technology.

113. *Industrial Chemistry:*—J. W. Bain, E. G. R. Ardagh, M. C. Boswell.
Department 6, IV Year.
A laboratory course in industrial problems.

114. *Electrochemistry:*—J. T. Burt-Gerrans.
Department 6h, 7h, and 8, IV Year; 2 hours per week, both terms.
An advanced lecture course on the theory of solutions and electrolysis, and the application to the practice of electro-deposition and electrolytic refining of metals. The course also includes lectures on the electric furnace with special consideration of efficiency.
Reference books:—Electrometallurgy—Borchers; Electrochemistry—Le Blanc; Electrochemistry—Luepke; Principles of Applied Electrochemistry—Allmand and Ellingham; The Electric Furnace—Stanfield; The Electric Furnace—Pring.

115. *Electrochemistry:*—W. L. Miller and J. T. Burt-Gerrans.
Departments 6h, 7h and 8, IV Year.
A laboratory course accompanying Course **114**.

116. *Sanitary and Forensic Chemistry:*—J. W. Bain.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on the composition and examination of air, water and food; poisons and their detection, with accompanying laboratory course.

116. (*a*) *Silicate Chemistry:*—J. B. Ferguson.
Department 8(a), IV Year; 2 hours per week, first term. The application of phase rule to the chemistry of refractory materials.

117. *Sanitary Chemistry:*—E. G. R. Ardagh.
Department 1_b, IV Year; 1 hour lecture and 6 hours laboratory, first term; four hours laboratory, second term.
A lecture and laboratory course on water supply, sewage disposal, ventilation, etc.

ECONOMICS AND BUSINESS ADMINISTRATION

121. *Business:*—W. S. Ferguson.
Departments 1, 2, 3, 6, 7, 8, I Year; 1 hour per week, second term.
A lecture course on the principles underlying accounting and general business methods of a simple nature in order to enable the student to understand simple financial reports.

122. *Technical English:*—W. J. T. Wright.
(*a*) All Departments, I Year; 1 hour per week, both terms.
A lecture course on the expression of ideas and the compilation and writing of different types of engineering reports; technical exposition; the derivation and use of technical terms; the necessity of accurate expression in professional writing; terminology; the use of graphic methods for presenting facts; abbreviations; numbers; symbols.
(*b*) Department 4, II Year; 1 hour per week, both terms.
This course of lectures includes a discourse on the literature which refers either directly or indirectly to architecture and the arts. Books are reviewed and discussed in round-table talks and essays prepared for practice in expression. The preparation of specifications and contracts for the execution of construction is continued from the course in the first year, specializing in architectural types.

123. *Economics and Finance:*—C. R. Fay.
All Departments, II Year; 1 hour per week, both terms.
An introduction to the study of Economics. The course will deal in an elementary fashion with the following:
(1) Scope and Method of Economics.
(2) Theory of Value and Distribution.
(3) Structure of Industry and Social Conditions.
(4) Money, Banking and Public Finance.
Text Book:—Economics for the General Reader—Clay.

124. *Commercial Law:*—A. R. Clute.
Departments 1, 4, 7, 8, III Year; 1 hour per week, both terms.
General Principles of the Law of Contracts, Principal and Agent, Partnership and Limited Companies (with special reference to the Companies Acts). General view of the following:—Negotiable Instruments, Sale of Goods, Bills of Sale and Chattel Mortgages, Suretyship and Guarantee.
Text-Book:—Stephens' Elements of Mercantile Law (6th Edition.)

125. *Engineering Economics:*—C. R. Young.
Departments 1, 2, 3, 3(a), 7 and 8, IV Year; 1 hour per week, second term.
A series of lectures on the principles by which the economic practicability of a project is judged and the comparison of competing proposals is made. Consideration is given to first cost and

annual cost, methods of estimating, fixed charges and operating expenses, valuation and appraisals. Special attention is given to depreciation and the methods of providing for it, as well as to its relation to amortization. Typical numerical problems are discussed and solved.

Text Books:—Engineering Economies—Fish; Financial Engineering —Goldman.

126. *Engineering Law:*—R. E. Laidlaw.

Department 1, IV Year; 1 hour per week, first term.

A course of lectures, co-ordinating Engineering practice and Law as contained in various legislation such as: The Railway Act, Municipal Act, Public Health Act, Arbitration Act, Workmen's Compensation Act, Patents, Copyrights, etc.

127. *Contracts and Specifications:*—C. R. Young.

Departments 1, 8, and 8 (a) IV Year; Department 4, V Year; 1 hour per week, second term.

This course of lectures deals with the fundamental principles of contract and specification writing. The critical examination of typical specifications and agreements by the class, forms an essential feature of the instruction.

Text Book: Elements of Specification Writing—Kirby.

128. *Management:*—C. R. Young.

Department 1, IV Year; 1 hour per week, first term.

A series of lectures dealing with the fundamental principles upon which management is based. The possibilities of effective management are indicated and its basis is shown to exist in suitable organization, adequate equipment and smooth administration. Consideration is given to such matters as selection of personnel, essentials of effective organization for enterprises of widely different character and the art of directing a force so as to attain a desired end in an expeditious and effective manner.

Text Books:—Construction Cost Keeping and Management—Gillette and Dana; Principles of Industrial Organization—Kimball; Administration of Industrial Enterprises—Jones.

129. *Plant Management:*—G. A. Guess.

Department 8 and 8 (a), IV Year; 1 hour per week, second term.

A course of twelve lectures dealing with some phases of labour, plant organization, smelter contracts and markets.

130. *Industrial Management:*—E. A. Allcut.

Departments 3, 3(a), 6 and 7, IV Year; 1 lecture per week, both terms.

This course includes a study of industrial organization, location, arrangement, construction and equipment of industrial plants for efficiency and economy, process routing, scheduling work,

reports, methods of superintending, employment, systems of compensating labour and systems of distributing indirect expenses.

131. *Railway Economics:*—W. M. Treadgold.

Department 1, (e), IV Year; 2 hours per week, both terms.

The object of this course is to make the student acquainted with the general principle of railroad engineering and the following branches of the subject will be discussed—economic theory of location, train resistance, effect of grade, distance and curvature, rise and fall, maintenance of way, yards and terminals, tunnels and street railway practice.

133. *Public Speaking:*—W. H. Greaves.

Department 1 and 4, III Year; 1 hour per week, first term.

A course on the principles of public speaking and the means of expression accompanied by practical application and training in actual speaking.

ELECTRICITY

135. *Electricity:*—H. W. Price.

Departments 1, 2, 3, 6, 7 and 8, I Year; 2 hours per week, both terms.

A course of lectures on basic principles relating to electric circuits, magnetic circuits, instruments and apparatus in general, distribution of electrical energy, etc., illustrated largely from commercial apparatus. The point of view of this work is quantitative rather than descriptive, for it is believed that men who can solve engineering problems are most likely to grasp underlying principles.

136. *Electricity:*—W. S. Guest.

Departments 3, 6, 7 and 8, II Year; 2 hours per week, both terms.

Deals with the theory of electrical measurements, and detailed study of various methods applicable under different conditions in engineering practice to the measurement of resistance, current, potential difference, power and energy; calibration of commercial measuring instruments. The effect of choice of conditions of measurement on the accuracy of the result is considered.

137. *Electrical Laboratory:*—W. S. Guest.

Departments 3, 6, 7 and 8, II Year; 3 hours per week, both terms.

This laboratory course is closely associated with the lecture course 136 on electricity for the second year. The more important and useful methods of testing generators and circuits for electromotive force, resistance, current, grounds, etc., are practised, often under con-

ditions such as occur in practice. The work also includes methods of calibration of measuring instruments for voltage, current, power and energy, and certain studies of properties of incandescent lamps.

138. *Magnetism and Electricity:*—A. R. Zimmer.

Departments 3 and 3(a), III Year; 1 hour per week, both terms.

Department 7, III Year; 2 hours per week, first term; 1 hour per week, second term.

A course of lectures on theory of magnetism and magnetic circuits, theory of direct-current generators, motors, etc.

139. *Alternating Current:*—A. R. Zimmer.

Departments 3 and 3(a), III Year; 1 hour per week, both terms.

Department 7, III Year; 1 hour per week, first term; 2 hours per week, second term.

A first course of lectures on alternating current, covering principles of measurement and leading to the analytical and graphical treatment of the simpler problems relative to alternating-current circuits and machinery.

140. *Electrical Laboratory:*—A. R. Zimmer.

Departments 3 and 3(a), III Year; 3 hours per week first term, 4½ hours per week second term; Department 7, III Year; 6 hours per week, both terms.

This laboratory course is intended to afford the student an opportunity to become familiar with principles involved in continuous-current shunt, series and compound-wound generators and motors, and, to some extent, alternating-current circuits and machinery. Other sections of the work deal with the magnetic properties of iron and steel, and study of iron losses in transformers and generators.

The course is arranged to stand in close relation to the lecture courses in the subjects of magnetism and electricity and alternating current (138, 139) for III Year, and to certain design work (141).

141. *Electrical Design:*—H. W. Price.

Department 7, III Year; 1 hour per week, both terms.

A course of lectures dealing with design of electrical apparatus and machinery, accompanied by designs to be worked out in the design room.

142. *Electrical Design:*—H. W. Price.

Department 7, III Year; 3 hours per week, both terms.

A design room is set apart for working out designs of electrical apparatus such as transformers, generators, motors, auxiliary apparatus, etc.

Special forms and notes are employed, arranged to suit the various studies. Certain models are provided to assist where necessary.

143. *Electricity:*—H. W. Price.

Departments 1, 2, 6 and 8, III Year; Department 2, II Year; 1 hour per week, both terms.

A continuation of Course 135, First Year, adapted to the requirements of non-electrical students. It deals with problems on direct-current circuits and apparatus; magnetic circuits; power measurements; alternating current principles and machinery; transmission; power-plants, etc.

144. *Electrical Laboratory:*—H. W. Price, A. R. Zimmer.

(*a*) Department 1.
III Year; 3 hours per week, first term.
IV Year; Options *d* and *e*, 3 hours per week, second term.

(*b*) Department 2.
IV Year; 3 hours per week, first term.

(*d*) Department 6.
III Year; 3 hours per week, second term.

(*e*) Department 8.
III Year; 3 hours per week, both terms.

These courses are arranged to suit the requirements of the departments concerned. The experiments are planned with the idea of affording a general knowledge of circuits, power measurements, direct-current and alternating-current machinery and transmission of power.

145. *Applied Electricity:*—(*a*) Symbolic and Graphical Methods,
(*b*) Wave Form and Transmission Line—T. R. Rosebrugh.

Department 7, IV Year; 2 hours per week.

(*a*) Complex quantities and their use in a.c. problems. Loci for current and voltage vectors for given limitations on circuit constants. Short line distribution circuit loci; approximate graphical theory of synchronous motor.

(*b*) Non-sinusoidal alternating current waves, analysis of waves, forms of symmetry, three phase limitations, elimination of undesired harmonics, heating of rotary converters; power, current, and voltage readings as influenced by wave form.

Long distance transmission line; principles and calculation. Unequal lines in tandem and in parallel.

Applied Electricity, (*c*) A.C. Machinery and Measurements:—H. W. Price.

Department 7, IV Year; 2 hours per week.

Polyphase alternating-current measurements of power, reactive power, apparent power, finding the indications of meters from given wiring diagrams, constructing wiring diagrams to obtain required meter indications. Potential and current transformers.

Meter indications with distorted wave forms. Power transformers. Properties of alternators; induction motors of squirrel cage and wound-rotor types; synchronous motors; regulators; current-limiting reactors; arresters; and other general apparatus.

146. *Electrical Laboratory:*—A. R. Zimmer.

Department 7, IV Year, in connection with 145; 20 hours per week.

This laboratory course involves a thorough study of principles and properties of single and polyphase circuits and apparatus. Both vector and analytical methods are applied to the solution of problems based on tests made on laboratory machines.

The work deals mainly with constant-voltage and constant-current transformers, single and polyphase alternators, synchronous motors, rotary converters, induction and single phase commutating motors, transmission line, etc. The work does not consist only of factory tests, but is designed to lead the student to apply theory to practice as illustrated in the apparatus under test, with a view to an exact understanding of methods and an appreciation of limitations under many conditions. Free use is made of the oscillograph as a necessary device for "seeing" conditions under investigation. The best commercial measuring instruments are available.

147. *Radiotelegraphy:*—T. R. Rosebrugh.

Department 7. Option *r*, IV Year, in connection with 148; 2 hours per week.

Natural oscillations of simple and simply coupled circuits. Action of C.W. on circuits of the most general character. Radiation of antennas. Theory of modulation in radiotelephony. Energy control and transformation by vacuum tubes.

148. *Radiotelegraph Laboratory;*—C. I. Soucy.

Department 7. Option *r*, IV Year, in connection with 147; 9 hours per week.

The work in this laboratory covers the principles and the technique of measurements at radio frequencies. This includes measurements of wave length, resonance, coupled circuits, inductance, capacity, energy distribution, resistance, etc., at radio frequencies.

Considerable work is also done with the three electrode vacuum tube and its uses in radio and audio-frequency circuits.

ENGINEERING DRAWING AND DESCRIPTIVE GEOMETRY

160. *Descriptive Geometry:*—J. R. Cockburn.

Departments 1, 2, 3, 6, 7 and 8, I Year; 1 hour per week; both terms.

This course of lectures deals chiefly with the principles of orthographic and oblique projections and the application of such principles to the solutions of problems relating to straight lines and planes.

161. *Descriptive Geometry:*—J. R. Cockburn.

Department 4, I Year; 1 hour per week; both terms.

This course of lectures deals chiefly with the principles of orthographic and oblique projections and the application of such principles to the solution of problems relating to straight lines and planes, special reference being made to the determination of shades and shadows.

162. *Descriptive Geometry:*—J. R. Cockburn.

Departments 1, 2, 3 and 7, II Year; 1 hour per week, both terms.

This course of lectures is a continuation of the work taken in the first year with the following additions: Problems relating to curved surfaces, principles of shades, shadows and perspective.

163. *Descriptive Geometry:*—J. R. Cockburn.

Department 4, II Year; 1 hour per week, both terms.

This course of lectures is a continuation of the work taken in the First Year with the addition of problems relating to curved surfaces, shades, shadows and perspective.

164. *Descriptive Geometry:*—J. R. Cockburn.

Department 1, III Year; 1 hour per week, first term.

This course of lectures deals with spherical projections, the principles of mapmaking, and the graphical solution of spherical triangles.

166. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.

Departments 1, 3, 7 and 8, I Year; 11 hours per week, first term; 18 hours per week, second term; Department 2, I Year, 9 hours per week, first term, 12 hours per week, second term.

Copying from the flat, lettering, topography; graphical solution of problems in statics; problems in descriptive geometry, relating to both orthographic and oblique projections; the plotting of original surveys; measured drawings.

167. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.

Department 4, I Year.

Lettering, the graphical solution of problems in statics; problems in descriptive geometry, relating to both orthographic and oblique projections; measured drawings.

168. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.

Department 6, I Year; 8 hours per week, first term.

Copying from the flat, lettering, graphical solution of problems in statics, problems in descriptive geometry.

169. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.

Departments 1 and 2, II Year. Department 1, 4½ hours per week, first term; 13½ hours per week, second term. Department 2, 3 hours per week first term; 10 hours per week, second term.

Colouring and shading as applied to both topographical and construction drawings; problems in descriptive geometry relating to solids bounded by curved surfaces; principles of shades, shadows and perspective; solution of problems in optics and strength of materials; measured drawings; elementary design.

170. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.

Departments 3 and 7, II Year; Department 3, 15 hours per week, first term; 7½ hours per week second term; Department 7, 12 hours per week, both terms.

Colouring and shading as applied to construction drawings; problems in descriptive geometry relating to solids bounded by curved surfaces; principles of shades, shadows and perspective; solution of problems in optics, theory of mechanism and strength of materials; measured drawings; elementary design.

171. *Engineering Drawing:*—J. R. Cockburn.

Department 4, II Year.

Principles of shades, shadows and perspective; problems in descriptive geometry relating to solids bound by curved surfaces; solution of problems in strength of materials.

172. *Engineering Drawing:*—J. R. Cockburn, W. J. T. Wright.

Department 6, II Years; 7 hours per week, first term; 3 hours per week, second term.

Department 8, II Year; 3 hours per week, first term; 6 hours per week, second term.

(Same as Department 3 with the exception that Dept. 6 has no descriptive geometry.)

173. *Engineering Drawing:*—W. B. Dunbar.

Department 1, III Year; 15 hours per week first term; 12 hours per week, second term.

Principles of mapmaking, spherical projection; problems in theory of construction; original design of various structures.

174. *Engineering Drawing:*—W. B. Dunbar.

Department 2, III Year; 9 hours per week, first term.

Problems in theory of construction; original design.

177. *Engineering Drawing:*—W. B. Dunbar.

Departments 3, 3(a), 6 and 8 (a), III Year; Department 3, 9 hours per week,

first term; Department 6, 6 hours per week, first term; Department 8 (a), 6 hours per week, both terms.

Problems in design dealing with the theory of structures.

178. *Structural Design Drawing:*—W. J. Smither.

Department 1 (c), IV Year; 22 hours per week, both terms.

Problems in structural design.

179. *Structural Design Drawing:*—W. J. Smither.
Department 1*b*, IV Year; 5 hours per week, second term.
Department 1*d*, IV Year; 4 hours per week, first term; 8 hours per week, second term.
Department 1*e*, IV Year; 6 hours per week, both terms.
Problems in structural design.

180. *Structural Design Drawing:*—W. J. Smither.
Department 3, IV Year; 3 hours per week, first term.
Problems in mill building design.

181. *Structural Design Drawing:*—W. J. Smither.
Department 3, IV Year, Option (b); 3 hours per week, first term.
Problems in reinforced concrete design.

182. *Engineering Drawing:*—W. B. Dunbar.
Department 8, III Year; 3 hours per week, first term.
Plotting metallurgical flow sheets.

183. *Structural Design Drawing:*—J. Roy Cockburn.
Department 8 (a), IV Year; 6 hours per week, both terms.
Original design of ceramic plants, driers, kilns, etc.

ENGINEERING PHYSICS

185. (*a*) *Illuminating Engineering:*—G. R. Anderson.
Departments 3 and 7, I Year.
A course on the production and distribution of artificial light. Photometry and illumination calculations. Principles of interior lighting.
Lectures and laboratory work, both terms.

185. (*b*) *Geometrical Optics:*—G. R. Anderson.
Departments 1 and 6, I Year.
Nature of light, reflection, refraction, and dispersion. Theory of optical instruments. Polarization of light and its applications.
Lectures and laboratory work, both terms.

186. *Hydrostatics:*—G. R. Anderson.
Departments 1, 6, 7, II Year; Department 3, II Year, lectures only.
Laws of fluid pressure and application to machines. Density of solids, and fluids. Theory of flotation.
Lectures and laboratory work, second term.

187. *Heat:*—G. R. Anderson.
Departments 1, II Year.
Generation and propagation of heat. General and industrial thermometry, calorimetry and pyrometry. Linear and cubical expansion, gas laws. Specific heat of solids, liquids and gases, latent heat of fusion and vaporization. Mechanical equivalent of heat. Carnot cycle.
Lecture and laboratory work. Fall term.

188. *Photography:*—K. B. Jackson.

Department 1 and 4, II Year.

The camera and its adjustments, lenses, shutters, screens. Plates for various purposes, films, prevention of halation. Lighting, exposure, development. Paper of various kinds, printing, enlargement and reduction, blue printing and allied processes. Record photography, photogrammetry and photo-surveying. Photography in colour.

Lectures Fall term, and laboratory work both terms.

189. *Illumination:*—G. R. Anderson.

Department 4, II Year.

A special course on interior illumination, and the design of lighting installations for private and public buildings.

190. *Acoustics:*—G. R. Anderson.

Department 4, IV Year.

Elementary acoustics, including production of sound by vibrating bodies. Special attention to the acoustics of buildings including the properties and uses of deadening material and calculations of reverberation.

191. (*a*) *Acoustics:*—G. R. Anderson.

Department 7r, IV Year.

Wave motion, Fourier's theorem, laws of vibrating systems, musical scales. Reflection and refraction of sound waves.

Combined lecture and laboratory course, first term only.

191. (*b*) *Photographic Surveying:*—G. R. Anderson.

Department 1a, IV Year; 1 hour lecture and 2 hours laboratory, first term.

This course presupposes a general knowledge of photographic processes as given in the second year. Treatment of a photograph as a perspective drawing from which plan and elevation to scale may be obtained under certain conditions. The intersection method of photographic surveying, its advantages and limitations. The stereoscopic method with its advantages and disadvantages. Method of plotting. Accuracy of results.

192. *Illumination Design:*—G. R. Anderson.

Department 7i, IV Year.

The design, installation and maintenance of artificial lighting for commercial and industrial operations. Street lighting. Economics of illumination.

GEOLOGY

193. *Field Work:*—E. S. Moore.

Department 2, III Year; one week preceding the opening of the first term.

194. *Pleistocene Geology and Physiography:*—A. MacLean.

Departments 2 and 8 (a), IV Year; 1 hour per week, both terms.

Pleistocene Geology.—Lectures on the formation and distribution of the drift deposits of North America, with brief references to other regions. Glacial, Interglacial, and Postglacial beds are described, changes of climate are discussed with their probable causes, and the economic features of the clays, sands, and gravels are pointed out.

Physiography.—A course of lectures on the surface forms of the earth, with the geological factors which have produced them. The broad features of the earth, its plains, tablelands, hills, valleys, mountains, oceans, rivers, and lakes are discussed in a general way; methods of topographical surveying and mapping are referred to, and the chief physiographic areas of Canada are described.

Works of Reference:—Ice Ages, Recent and Ancient—Coleman; Physiography—Salisbury.

195. *Elementary Geology:*—W. A. Parks.

Departments 1, 2, II Year; 2 hours per week, second term.

This course deals chiefly with historical geology with special reference to Canadian formations.

Works of Reference:—Introduction to Geology—Scott; Elementary Geology—Coleman and Parks.

196. *Geology and Ore Deposits:*—A. MacLean.

Department 8, II Year; 2 hours per week, both terms.

Lectures and laboratory work on historical, structural, and economic geology, designed to familiarize the student with the more important principles, facts, and terms of general geology.

Works of Reference:—As in Course 195.

197. *Engineering Geology:*—A. MacLean.

Department 1 and 8 (a), III Year; 1 hour per week, both terms.

This course deals with the application to engineering of dynamic, structural, and economic geology.

Works of Reference:—Engineering Geology—Ries and Watson.

198. *Dynamic and Structural Geology:*—A. MacLean.

Department 2, II Year; 1 hour per week, first term.

Lectures on geological forces and their effects. Particular attention is given to those aspects of the subject which apply in mining.

199. *Precambrian Geology:*—E. S. Moore.

Department 2, IV Year; 2 hours per week, first term.

Lectures on the Precambrian formations of Canada—their rocks, distribution, relationships, and economic features. Briefer accounts are given of similar formations in the United States and elsewhere.

Works of Reference:—Reports of the Geological Survey of Canada and of the Ontario Department of Mines; Reports of the United States Geological Survey.

200. *Mining Geology:*—E. S. Moore.

Department 2, IV Year; 2 hours per week, second term.

A course of lectures on geological problems associated with mining, typical mining regions in Canada, the United States, and elsewhere being discussed from the geological side.

Works of Reference:—Mineral Industry; Geology Applied to Mining —Spurr; and the works mentioned under Course 199.

201. *Geological Excursions:*—The Staff in Geology.

Departments 2 and 8 (a), IV Year.

During October and November weekly trips will be made to points of interest near Toronto.

202. *Economic Geology:*—E. S. Moore.

Department 2, III Year.

(*a*) *Ore Deposits:* 1 hour per week, both terms.

Discussion of the origin and classification of ore deposits, the mode of occurrence of the chief ores, and statistics of production. Special attention is given to the metals mined in Canada.

(*b*) *Economic Geology of the Non-metals:* 2 hours per week, second term.

Lectures on the origin and mode of occurrence of the valuable non-metallic substances—coal, oil, building stone, gypsum, cement materials, etc.

Works of Reference:—Economic Geology—Ries; General Economic Geology—Emmons; Ore Magmas—Spurr; Coal—Moore; Practical Oil Geology—Hager.

203. *Economic Geology:*—E. S. Moore.

Department 2, III Year; 2 hours per week, second term.

Laboratory work on ores, manner of occurrence, vein structure, etc., also the examination and construction of geological maps and sections of typical mining regions.

204. *Special Geology:*—A. MacLean.

Department 1 (e), IV Year; 1 hour lecture and 1½ hour laboratory work per week, second term.

A lecture and laboratory course on superficial geology, physiographic control, water geology, etc.

Works of Reference:—Political and Commercial Geology—J. E. Spurr.

HYDRAULICS

205. *Hydraulics:*—R. W. Angus.

Departments 1, 2, 3, 3a, 6 and 7, III Year; 2 hours per week, both terms.

This is a course of lectures in hydraulics devoted to the development and discussion of formulae relating to the flow of water in pipes, the measurement of discharge by various methods, such as orifices and weirs, the conditions of flow obtaining in open channels, artificial and natural, and in pipes flowing partially full, together with other kindred subjects.

The object of this course is to provide the student with a good working knowledge of the fundamental principle of hydraulics, such as is useful in practical work, and is necessary to the intelligent investigation of more advanced problems, such as the design of water supply, sewerage and irrigation system, and water power plants.

206. *Hydraulic Laboratory:*—R. W. Angus, R. Taylor.

Departments 1, 2, 3 and 3(a), III Year; one 3 hour period per week, second term.

Departments 6, 7, III Year; 4 periods of 3 hours each.

The work in this course is intended to illustrate the lecture course given in hydraulics and to give the student some working acquaintance with the formulae met with in practice. Experiments are made to determine the coefficients for orifices of the various types used in practice and for a weir. The results of these experiments are used in measuring the discharge in subsequent experiments on meters and for the determination of hydraulic resistances in various cases of flow in pipes. The complete course illustrates very fully the application of the course of lectures to actual cases.

207. *Hydraulics:*—R. W. Angus.

Departments 1 (d), 3 and 7 (d), IV Year; 1 lecture per week, both terms.

A course of lectures dealing with the various problems of unsteady flow such as occurs in power lines, penstocks, etc. Much of the work is done by the process of arithmetic integration, and

the lecture work is supplemented by problems solved by the students in the work rooms, the time for which is included in course 209. Surges, water hammer, stream flow data, etc., are discussed.

The problems of collection of water for power purposes, use of the mass curve, rainfall and evaporation, turbine governing, etc., are also treated as far as possible.

208. *Hydraulics:*—R. W. Angus.

Departments 1 (d), 3 and 7 (d), IV Year; 2 lectures per week, both terms.

The most important question considered and to which most of the lectures are devoted is the theory of turbines and centrifugal pumps, the effect of the design on the speed, discharge and efficiency being fully taken up. The course includes the selection of turbines and pumps for given service intakes, draft tubes and all matters connected with hydraulic power plants.

209. *Hydraulics:*—R. W. Angus, R. Taylor.

Departments 1 (d) and 7 (d), IV Year; about 10 hours per week in 3 hour periods, both terms; Department 3, average of 7½ hours per week in 3 and 2 hour periods.

A laboratory course devoted to experimental work on turbines of various types and centrifugal and turbine pumps and other similar devices. This experimental work is arranged to illustrate the lectures on turbine and pump design. The experiments are made on hydraulic models and on two large turbine pumps used in the laboratory supply, as well as on apparatus specially designed for instruction. Various methods of measuring water-power and the efficiency of machines are also given. A list of the equipment now available, and which is used in this course, is given at the end of the Calendar.

210. *Hydraulic Laboratory;*—R. W. Angus, R. Taylor.

Department 8, IV Year; 3 hours per week, second term.

A laboratory course of experiments on orifices, weirs, meters, etc. See No. 206.

211. *Hydraulics:*—R. Taylor.

Department 1_b, 1_e, IV Year; one hour lecture per week, first term.

A laboratory course of 3 hours per week, first term, on measurement of water, flow in open channels and on pumps.

HEAT ENGINES

216. *Steam and Heat Engines:*—E. A. Allcut.
Departments 3 and 7, II Year; 1 lecture per week, both terms.
Departments 2 and 8, II Year; 1 lecture per week, first term.
A course of lectures dealing with the history and development of the steam engine with special reference to the theory and design of valves and valve operating mechanisms. The principles of heat engines and the various forms of heat engine are also discussed briefly.

217. *Thermodynamics:*—E. A. Allcut.
Departments 3, 3(a), 6 and 7, III Year; 2 lectures per week, both terms.
In this lecture course the laws of heat are used to develop the characteristic equation for a perfect gas and the use of thermal lines on the pressure-volume diagram. The properties of Carnot's cycle are then considered, followed by application of these principles to the hot-air engine, internal combustion engine and air compressor. A consideration of the properties of vapours and their application to the steam engine cycle concludes the course.

218. *Heat Engines:*—E. A. Allcut.
(*a*) Departments 3, 3(a), 7 and 8, III Year; 1 lecture per week, both terms.
This course of lectures is intended to supplement the general lecture course in Thermodynamics by showing the practical application of the laws discussed therein. The laws of combustion, their application to the boiler practice and the generation and uses of steam are the principal points considered.
(*b*) Department 3, III Year; 1 lecture per week, both terms.
These lectures are a further development of the internal combustion work commenced in the Second Year, the influence of thermodynamic considerations on the design of heat engines, and problems in heat transfer, being discussed. The laws of heat transmission and their influence on Heating and Ventilation problems are also considered.

219. *Thermodynamics and Mechanical Laboratory:*—R. W. Angus, E. A. Allcut, G. H. Harlow.
Departments 3 and 3(a), III Year; one 3 hour period per week, both terms.
Department 7, III Year; 3 hours per week, first term; 1 hour per week, second term. Time to be in three-hour periods.
This laboratory course is designed to assist in a clearer understanding of thermodynamics, machine design and mechanics of machinery. The work in thermodynamics consists in the setting of slide valves, indicating engines measuring the brake horse-power, simple en-

gine and boiler tests and the testing of gas and gasoline engines under various conditions. The mechanical laboratory work deals with the efficiency of belts as well as of several machines of simple construction. An examination of lubricating oils is also made by means of well-known methods. Experiments are also made on the balancing of reciprocating and rotating masses.

220. *Thermodynamics:*—E. A. Allcut.

Departments 3 3(a) and, 7(f), IV Year; 2 lectures per week, both terms.

This is a continuation of course 217, the general thermodynamic theory being studied from the conception of the thermodynamic surface. The theory of the flow of gases and vapours through orifices, nozzles and pipes is then discussed and its application to the various forms of turbines is outlined. Following this, the principles of refrigeration, binary fluid engines, internal combustion engines and heat transmission are dealt with.

221. *Heat Engines:*—E. A. Allcut.

Departments 3 and 7 (f), IV Year; 1 lecture per week, both terms.

This course is a continuation of the lectures on heat engines given in the Third Year, with special application to the steam power plant. The causes of the various losses occurring in steam engines and the considerations that influence them are studied in detail. Special attention is given to condensing plants, consumption records and other factors upon which the efficiency of a power plant depends; also problems in heat transmission.

222. *Thermodynamics;*—R. W. Angus, E. A. Allcut, G. H. Harlow.

Departments 3 and 3(a), IV Year; average 7½ hours per week, and 7(f), IV Year about 9 hours per week, all in 2 or 3 hour periods.

The work in this year is a continuation and extension of the work covered in the third year laboratory course. Careful tests are made of heaters and of engines of various types, such as simple, tandem and cross-compound steam engines; steam turbine; refrigerating machine; injectors and steam pumps, etc.; and an application is made of Hirn's analysis and the entropy diagram to the results obtained. A complete set of experiments is made on each machine and the result plotted so as to show clearly to the student the effect of various alterations in the adjustment of the engine on the resulting efficiency.

Several modern gas and gasoline engines give ample opportunity for the study of this type of engine, and facilities are provided for sampling the gas supply and exhaust.

Two experimental stacks and three boilers enable results to be obtained on boiler efficiency and chimney draft.

223. *Thermodynamics:*—E. A. Allcut.

Departments 1 and 8 (a), III Year; 1 lecture per week, both terms Departments 2 and 8, IV Year; 1 lecture per week, both terms.

The general principles of thermodynamics, the properties of a perfect gas and their application to the Carnot cycle are first studied. This is followed by a consideration of the air compressor cycle, some details of air compressor operation and the theory of the flow of air through pipes and orifices. The properties of vapours and the principles of steam engine operation are also discussed.

224. *Thermodynamic Laboratory:*—G. H. Harlow.

Departments 1, 6 and 8 (a), III Year; seven three hour periods, second term; Departments 2 and 8, IV Year; 3 hours per week, first term.

A course of experiments with steam and gas engines, compressed air, etc.

225. *Motive Power:*—R. W. Angus.

Department 1 (e), IV Year; one hour per week, both terms.

A course of lectures covering boiler capacity, locomotive horse-power, tractive effort, etc., necessary to carry specified trains over different conditions of roadbed.

MACHINERY

230. *Theory of Mechanism:*—J. H. Parkin.

Departments 3 and 7, II Year; lectures 2 hours per week; problems 1½ hours per week, both terms.

This course of lectures treats of the elementary construction of machines and of the motions of the various parts. Methods of determining linear and angular velocities, methods for the solution of elementary problems involving forces and methods for the determination of the mechanical efficiency of machines are discussed. Velocity diagrams, crank effort and torque diagrams are plotted. Cams, toothed gearing and various types and applications of trains of gearing are considered.

Applications of the methods described are made to various machines including engines, machine tools, link motions, etc., and the lecture work is followed up by the solution of numerous examples in the drafting room.

Text Book:—Theory of Machines—Angus.

231. *Mechanics of Machinery:*—J. H. Parkin.

Departments 3, 3(a) and 7, III Year; 1 hour per work, both terms.

This course is devoted to a consideration of the speed regulation and balancing of machines, and comprises lectures on the theory of various forms of governors, kinetic energy of machines and

determination of speed fluctuations, the proper weight of fly-wheel, acceleration and inertia effects, and balancing.

The methods of analysis employed are those developed in course 230.

Text Book:—Theory of Machines—Angus.

232. *Elementary Machine Design:*—W. G. McIntosh.

Departments 3, 6 and 7, II Year; 1 hour per week, both terms.

This is a preparatory course intended to familiarize the student with the different shop methods and processes, casting, forging, machining, etc., used in the production of machine parts, to enable him to make proper provision in the design of such parts to facilitate their production.

In addition, the various standards, machine and pipe threads, tapers, pipe fittings, etc., are described and mechanical drafting room practice explained.

Tolerances, limits, fits and gauges are discussed.

The design of simple machine fastenings and parts is taken up and examples worked out in the drafting room.

233. *Machine Design:*—W. G. McIntosh.

Departments 3, 3(a) and 7, III Year; 2 lectures per week, both terms.

The design work averages 7 hours per week for Department 3, and 4 hours per week for Department 7, the periods to be of not less than 2 hours' duration.

The lectures in this course deal with the design of various machine elements, including shafting, bearings (journal, thrust, ball and roller), belts, pulleys, fly-wheels, clutches, springs, machine frames, etc.

The problems worked out in the drafting room are planned to include the design of all of the above and with a view to developing the student's judgment and sense of proportion in design.

Text Book:—Principles of Machine Design—Norman.

234. *Machine Design:*—W. G. McIntosh.

Departments 2 and 6, IV Year; Department 8 and 8 (a), III Year; 1 lecture per week, both terms.

The design work occupies 3 hours per week for the second term only.

The lectures in this course deal with the design of various machine elements, particularly those likely to be met with in Chemical and Metallurgical plants, and in mining work.

The problems worked out in the drafting room are designed to give the student training in the general lay-out of shafting and plant machinery, as well as in the design of simple parts for chemical and metallurgical apparatus, and mine machinery.

235. *Advanced Machine Design:*—J. H. Parkin and W. G. McIntosh.

Department 3, IV Year; 2 lectures per week.

The design work averages 7 hours per week, the periods to be of not less than 2 hours' duration.

The work of this course is devoted to the design of complete machines with the object of giving the student practice not only in the design of various details, but also in working in the various elements into a machine of smooth and harmonious design. The machines chosen as examples for design involve as many new machine elements as possible in order to broaden the training of the student.

Text Book:—Principles of Machine Design—Norman.

MATHEMATICS

236. *Calculus:*—M. A. Mackenzie and S. Beatty.

All Departments, I Year; 2 hours per week, each term.

Treatment of limits with special reference to those pertaining to exponentials and logarithms. Derivation of the fundamental formulae of the differential and integral calculus, with early application to simple problems concerning graphs, areas, volumes, lengths, etc.

237. *Calculus:*—M. A. Mackenzie and S. Beatty.

Departments 1, 3, 6 and 7, II Year; 2 hours per week, each term.

Continuation of course 236. The elementary theory reviewed and extended. Special attention to applications with problems in Engineering mostly in view.

238. *Analytical Geometry:*—I. R. Pounder and D. A. F. Robinson.

All Departments, I Year; 1 hour per week, first term, 2 hours per week, second term.

The course in Elementary Analytical Geometry covers the more familiar propositions in connection with the straight line, circle, parabola, ellipse and hyperbola. The subject is treated so as to illustrate the general methods of analytical geometry.

239. *Trigonometry, Spherical:*—J. W. Melson.

Department 1, II Year; 1 hour per week, second term.

A course of lectures includes the derivation of formulæ and their application to the solution of triangles and to practical problems.

Text Book:—Spherical Trigonometry—Todhunter and Leatham.

240. *Least Squares, Method of:*—L. B. Stewart.

Department 1, III Year; 1 hour per week, second term.

The course of lectures includes: The general principles of probability, the law of error, direct measurements of equal and different weights; mean square and probable errors; indirect measurements; conditioned observations; applications to empirical constants and formulæ, etc.

Text book:—Least Squares—Merriman.

METALLURGY

241. *Elementary Metallurgy:*—G. A. Guess.
Departments 1, 2, 3, 6 and 8, II Year; 1 hour per week, second term.
A course of about 12 lectures on furnace metallurgy and present practice, with special reference to iron and steel.

242. *Fuels and Combustion:*—G. A. Guess.
Department 8, II Year; 1 hour per week, both terms.
A lecture course dealing with fuels, their use, preparation, calorific value and combustion.

243. *Metallurgy:*—G. A. Guess.
Departments 2, 6, III Year; 1 hour per week, both terms.
Fuels, temperature of combustion, specific heat, conductivity and problems thereon; chimneys, furnaces, refractories, outline of furnace metallurgy and hydro-metallurgy.

244. *Physical Metallurgy:*—J. A. Newcombe.
Departments 3, 3(a), 6 and 7, III Year; Department 2, IV Year; 2 hours per week, second term.
The physical properties and structure of iron and steel and the more common alloys.

245. *Metallurgy:*—G. A. Guess, J. E. Toomer.
Department 8, III Year; 2 hours per week, first term; 1 hour per week, second term.
A lecture course on General Metallurgy accompanied by 3 hours laboratory per week, first term, and 6 continuous hours per week second term.

246. *Physical Metallurgy:*—J. A. Newcombe.
Department 8, III Year; 1 hour per week, both terms.
Changes of phase and of state, pyrometry, preparation of alloys, miscibility of metals, binary, ternary and complex alloys, the use of the microscope, with 3 hours laboratory per week, first term.

247. *Metallurgy:*—G. A. Guess, J. E. Toomer.
Departments 2 and 6 (k), IV Year; 1 hour lecture per week, both terms; 6 continuous hours laboratory per week, second term.
General metallurgy and metallurgical problems.

248. *Metallurgy Problems:*—G. A. Guess, J. E. Toomer.
Department 8, IV Year; 2 hours lecture and 4 hours laboratory per week, both terms.
Metallurgical book-keeping, balance sheets, thermal balance sheets, methods and processes.

249. *Metallurgy:*—G. A. Guess.
Department 8, IV Year; 1 hour per week, both terms.
Critical reading and discussion of papers and articles, describing metallurgical processes or dealing with plant arrangement and construction. Metallurgical flow sheets of typical plants.

250. *Physical Metallurgy:*—J. A. Newcombe.
Departments 6 (k) and 8, IV Year; 1 hour lecture and 3 hours laboratory per week, both terms.

251. *Metallography:*—J. A. Newcombe.
Department 2, IV Year.
A laboratory course of 3 hours per week, second term.

252. *Physical Metallurgy:*—J. A. Newcombe.
Department 1 (c), (d) and (e), IV Year; 1 hour per week, both terms.
The physical properties of metals and alloys used in Civil Engineering practice—specifications.

253. *Heat Treatment of Iron and Steel:*—J. A. Newcombe.
Departments 3 and 3(a), IV Year; 1 lecture per week, both terms.
Heat treatment of iron and steel, case carburizing, case hardening and malleableizing.

CERAMICS

254. (*a*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 4 hours per week, first term; 2 hours per week, second term.
Lectures covering origin, properties and classification of clays and other ceramic materials from a mnaufacturing standpoint; methods of manufacture, including preparing, shaping and burning clay ware.

254. (*b*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 2 hours per week, second term.
Lectures on the composition of clear and coloured glazes.

254. (*c*) *Ceramics:*—J. E. Toomer.
Department 8 (a), III Year; 1 hour per week, second term.
Lectures and problems on calculations necessary for the compounding of ceramic bodies and glazes.

254. (*d*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 6 hours per week, both terms.
Work on the identification and testing of clays.

254. (*e*) *Ceramics:*—J. E. Toomer.
Department 8 (a), III Year; 6 hours per week, both terms.
Laboratory practice in the analysis of ceramic materials.

254. (*f*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 2 hours per week, first term.
Lectures on composition and properties of refractory material; composition of bodies made with ceramic material, with special reference to white-ware and porcelain.

254. (*g*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 2 hours per week, second term.
Lectures on the manufacture and composition of glass; manufacture and composition of iron enamels.

254. (*h*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 1 hour per week, second term.
Lectures on specifications, testing and methods of testing ceramic materials.

254. (*i*) *Ceramic Laboratory:*—R. J. Montgomery.
Department 8 (a), IV Year; 9 hours per week, both terms.
Advanced work on compounding and testing ceramic bodies and glazes.

MINERALOGY

255. *Elementary Mineralogy:*—J. E. Thomson.
Department 2, I Year; Department 8 (a) III Year; 2 hours per week, first term.
After introducing the student to the chief chemical, physical, and crystallographic characteristics of minerals, the course becomes descriptive and deals with about one hundred of the minerals most important from the industrial or scientific point of view.
Text Book:—Text-book of Mineralogy—Dana.

256. *Mineralogy:*—J. E. Thomson.
Departments 6 and 8, I Year; 2 hours per week, first term; 1 hour per week, second term.
Introduction to determination of minerals by inspection and physical tests.
Text Book:—Mineral Tables—Eakle.

257. *Primary Mineralogy:*—A. L. Parsons.
Department 1, II Year; 2 hours per week, first term.
A very brief introduction to the study of minerals and rocks.
Text books:—Study of Minerals and Rocks—Rogers; Hand-Book of Rocks—Kemp.

258. *Mineralogy:*—J. E. Thomson.
Department 2, I Year; 1 hour per week, first term; 3 hours per week, second term.
Department 8 (a), III Year; 1 hour per week, first term.
Determination of minerals by inspection and by means of physical tests; introduction to blow-pipe practice.
Text books:—Mineral Tables—Eakle; Determinative Mineralogy—Lewis.

259. *Mineralogy:*—A. L. Parsons, J. E. Thomson.

Department 1, II Year; 1 hour per week, first term; 2 hours per week, second term.

Determination of minerals by inspection and by means of physical tests; study of common rock types and their identification.

Text books:—Mineral Tables—Eakle; Handbook of Rocks—Kemp.

260. *Elementary Petrography:*—T. L. Walker.

Department 2, II Year, and Department 8 (a), III Year; 1 hour per week, both terms.

A course of lectures and laboratory work introducing the student to the macroscopic study of rocks.

Text books:—Handbook of Rocks—Kemp.

261. *Mineralogy:*—J. E. Thomson.

Department 2, II Year; 2 hours per week, both terms.

Determination of minerals by means of the blow-pipe and physical properties.

Text books:—Mineral Tables—Eakle; Determinative Mineralogy—Lewis.

262. *General Petrography:*—A. L. Parsons.

Department 2, III Year, and Department 8 (a), IV Year; 1 hour per week, both terms.

Study of the chief rock-forming minerals and of some phases of petrography not covered in the course of the previous year.

Text Books:—Minerals in Rock-Sections—Luquer; Petrology for Students—Harker.

263. *Petrography:*—T. L. Walker.

Department 2, III Year, and Department 8 (a), IV Year; 2 hours per week, both terms.

Study of the chief rock-forming minerals, of rocks in thin sections and in hand specimens.

Text books:—Petrology for Students—Harker; Minerals in Rock Sections—Luquer.

MODERN LANGUAGES

264. *French:*—F. C. A. Jeanneret, Miss J. C. Laing, M. Poirier.

Required in Department 4, I and II Years; 2 hours per week, both terms; III Year, 1 hour per week, both terms.

(*a*) Practice in translation of selected texts bearing on some phase of architectural study.

(*b*) A course in Conversation to encourage the student to acquire a speaking knowledge of the language.

265. *German:*—B. Fairley, T. J. Hedman, G. E. Holt.
Department 6, all years; I Year, 2 hours per week, both terms; II, III, IV Years, 1 hour per week, both terms.
An elementary course intended to train the student in the translation of scientific journals and treatises.

266. *Spanish:*—M. A. Buchanan.
Departments 6*k*, IV Year; 8, II Year; 1 hour per week, both terms.
An introduction to Spanish grammar, pronunciation and practice in reading Engineering Spanish.

MUNICIPAL ENGINEERING

267. *Sanitary Engineering:*—P. Gillespie.
Department 1b, IV Year; 1 hour lecture per week, both terms; 3 hours laboratory, first term; and 6 hours, second term.
Consideration is given to the problems of water supply, sewerage and sewage disposal as viewed by the engineer. Some practice in the design of works from assumed data is afforded. Excursions to places of interest are arranged from time to time.
Reference Books:—Public Water Supplies—Turneaure and Russell; American Sewerage Practice—Metcalf and Eddy, 3 vols.

268. *Highway Engineering:*—A. T. Laing.
Department 1b, IV Year; 1 hour lecture and 3 hours laboratory per week, both terms.
This course of instruction deals with the design, construction and maintenance of public highways and street pavements, also with the properties of the materials employed. Accompanying the course of lectures is a laboratory course dealing with subsoils, bituminous and non-bituminous materials of construction. Excursions to places of interest are arranged for during the fall term.

269. *Municipal Government and Administration:*—P. Gillespie and A. T. Laing.
Department 1b, IV Year; 4 hours per week both terms.
A lecture course and seminar dealing with local improvement laws, assessments, building codes, fire control and public utilities; reading, essay writing and discussions of problems relating to municipal government, highway transportation, town planning, sanitation and kindred subjects.

SURVEYING

270. *Surveying:*—S. R. Crerar.
Departments 1, 2, 3, 7 and 8, I Year; 1 hour per week, both terms.
The lecture course includes the general principles; surveying with the chain, the compass and chain and the transit and chain, and

level, the applications of trigonometry to inaccessible heights and distances; mensuration of surfaces, co-ordinate surveying, division of land, etc.

Text books:—Plane Surveying—Tracy; Theory and Practice of Surveying—Johnson and Smith; Elementary Surveying—Breed and Hosmer.

271. *Field Work:*—S. R. Crerar, J. W. Melson.

Departments 1, 2, 3, 7 and 8, I Year; 6 hours per week, first term.

This course comprises testing chains; practice in chaining; a complete survey of a piece of land with the chain and transit; keeping of field notes; the use of the transit and compass in surveying closed figures and traverse lines and in ranging straight lines; plotting by latitudes and departures, and otherwise computing areas. Instrumental work with level, including roadway improvement.

272. *Surveying:*—W. M. Treadgold.

Department 1, II Year; 1 hour per week, both terms.

This course of lectures takes up in detail, simple, reverse and compound curves as applied to railroad surveying. It also includes stadia, plane table and photographic surveying as applied to topographic work, and the main features of mine and hydrographic surveying.

Text books:—Henck, Searles, Allen (Field books for Engineers) Theory and Practice of Surveying—Johnson and Smith; Surveying—Breed and Hosmer.

272 (*a*). *Surveying:*—E. W. Banting.

Department 2, II Year; 1 hour per week, both terms.

This course of lectures takes up mine surveying with problems related thereto. It also includes the simple curve as applied to railroad surveying, stadia topographical surveying, plane table and the main features of hydrographic surveying.

Text books:—Surveying—Breed and Hosmer; Mine Surveying—Durham.

273. *Field Work:*—W. M. Treadgold, E. W. Banting.

Department 1, II Year; 9 hours per week, first term.

Department 2, II Year; 6 hours per week, first term.

This course of instruction embraces all adjustments of the transit and level, minor problems in triangulation and traversing—levelling and plane table practice.

274. *Surveying and Levelling:*—W. M. Treadgold.

Department 1, III Year; 1 hour per week, both terms.

This course of lectures takes up the work of the railroad engineer on construction, including profiles, cross sectioning, computation of

volume of earthwork, overhaul, transition curves, laying out turnouts, frogs and switches, etc.

Also a discussion of trigonometric and barometric levelling

Text books:—Field Engineering—Searles; Railroad Curves and Earthworks—Allen.

275. *Survey Camp:*—W. M. Treadgold, S. R. Crerar, E. W. Banting, J. W. Melson.

Departments 1 and 2, III Year; Department 1a, IV Year.

This course includes:

(*a*) Secondary Triangulation and Base Line Measurements.
(*b*) Stadia, Plane Table and Boundary Traverses.
(*c*) Highway and Railway Location.
(*d*) Cross Sectioning and Computation of Earthwork.
(*e*) Stream Gauging and Discharge Measurements.
(*f*) Hydrographic Surveying.
(*g*) Photographic and Micrometer work.
(*h*) Stadia and Plane Table Topography.
(*i*) Mine Surveying.
(*j*) Observations for Time, Azimuth and Latitude.
(*k*) Geological Survey.

This work is taken at Gull Lake Camp. See page 37.

276. *Railroad Location and Design:*—W. M. Treadgold.

Department 1 (e), IV Year; 1 hour lecture per week, both terms; about 8 hours per week, both terms, in the drafting room.

This work will consist of an original survey for a railroad some one or two miles in length, the work to be carried out according to the most modern methods of location. Upon the completion of the field work, the complete survey will be plotted and a line adjusted to it. This will be staked out, profiles taken and the computation made of the earthwork and the preparation of overhaul diagram compiled for determination of haul and borrow. In the second term the design of track work, yards and practical problems will be taken up and special problems assigned.

PHYSICAL TRAINING

280. *Physical Training*:—G. D. Porter.

Required in all departments, I and II Years, and optional in the III and IV. Years.

By order of the Board of Governors each male student proceeding to a degree must take Physical Training in the first and second years of his attendance. In each session in which Physical Training is compulsory he must first undergo a medical examination by the Director of the University Health Service, and must then

register for Physical Training at the office of the Athletic Association in Hart House. Students of all years who wish to take part in any form of athletics or physical exercise, must first undergo a medical examination by the Director. Those classified as A1 may elect to take any form of competitive athletics during the season in which that form of sport is in progress.

Military training in the C.O.T.C. constitutes an option in Physical Training (see page 133).

283. *Zymology:*—H. B. Speakman.

A study of the phenomena of fermentation and their industrial applications.

THESIS

285. *Thesis.*

Required in all Departments, IV Year, with the exception of Department 4, Architectural Design Option. Department 3, IV Year; 1 hour per week, both terms.

Each student must prepare a thesis on a subject and in a form approved by the head of the department in which the student is registered.

AERONAUTICS

301. *General Aeronautics:*—J. H. Parkin.

Department 3(a), III Year; 1 hour per week, both terms.

An introductory course of lectures covering history of flight, general principles of aeronautics, kites, gliders, aeroplanes, balloons, kite balloons, dirigibles and special type of aircraft, descriptions of modern aircraft.

302. *Elementary Aerodynamics:*—J. H. Parkin.

Department 3(a), III Year; 2 hours per week, second term.

A lecture course dealing with properties of air, the atmosphere, general aerodynamics, aerodynamical properties of plates, aerofoils, struts, streamline bodies, and other structural elements of aircraft, theory of model testing.

303. *Aerodynamics:*—J. H. Parkin.

Department 3(a), IV Year; 1 hour per week, both terms.

A continuation of Course 302. Aeroplane stability and control, performance analysis and calculation. Theory and discussion of special types of aircraft.

304. *Aerodynamic Laboratory:*—J. H. Parkin.

Department 3(a), IV Year; 6 hours per week, both terms.

Calibration and use of instruments, experimental determination of the air forces and moments on model wings, aircraft components and complete aircraft. Pressure plotting, air flow studies.

305. *Aircraft Materials:*—J. H. Parkin.
Department 3(a), IV Year; 1 hour per week, first term.
Properties of timber, plywood, fabric, dopes, glue, rubber, light alloys, special steels and of spars and struts of special form, welded connections, tubes, cables.

306. *Aeroplane Design and Stress Analysis:*—J. H. Parkin.
Department 3(a), IV Year; 2 hours per week, 6 hours per week in drafting room, both terms.
Load factors, design for aerodynamic and structural requirements. Stresses during different manœuvres, form, arrangement and design of details.

307. *Aircraft Engines:*—E. A. Allcut.
Department 3(a), IV Year; 1 hour per week, both terms.
A study of the special features of aircraft motors, examination of the different types, special auxiliaries and accessories.

SCHOOL OF ENGINEERING RESEARCH

A School of Engineering Research, within the Faculty of Applied Science and Engineering, was established in the Spring of 1917 at the suggestion of the late Dean Ellis.

The School is under the direct supervision of a Committee of Management composed of fifteen Members of the Faculty Council. To this Committee is entrusted the selection of researches to be undertaken under the auspices of the School, and the disposition of funds conducting them.

The School was organized chiefly for the training of graduates in methods of research, and for the carrying out of investigations. These latter may be problems relating to specific industries or raw materials and having a specific end in view, or general problems having to do with fundamental principles.

A number of research assistants are appointed annually in the various departments of the Faculty to carry on the work of research under direction of members of the staff. The facilities of the School are also open to graduates who desire to penetrate more deeply into particular phases of experimental work, or to undertake investigations either suggested by members of the staff or arising from their own work since graduation.

Address communications to the Secretary—Professor Maitland C. Boswell, Ph.D.

ADVANCED COURSE IN HYDRO-ELECTRIC POWER

In view of the importance of Hydro-Electric power in Canada, further facilities are offered to those graduates who wish to supplement the present extensive undergraduate courses bearing upon this subject. Graduate studies may be pursued by candidates for the Degree of Master of Applied Science as soon as desired after graduation.

To those returning after satisfactory experience in some approved phase of Hydro-Electric work, somewhat more specialized courses may be given than are possible with very recent graduates. The Engineering Alumni Association of the University has expressed its willingness and desire to assist such candidates in obtaining suitable employment to fit them for these courses of study, but such courses are available only to those with the proper undergraduate preparation.

Graduates who may wish to avail themselves of the arrangements proposed are advised to communicate with the Dean.

It should be noted that candidates for post-graduate degrees register with the Secretary of the School of Graduate Studies. For further particulars see Calendar of the School of Graduate Studies and succeeding pages of this Calendar.

REGULATIONS FOR DEGREES OF MASTER OF APPLIED SCIENCE, MASTER OF ARCHITECTURE, CIVIL ENGINEER, MINING ENGINEER, MECHANICAL ENGINEER, ELECTRICAL ENGINEER, CHEMICAL ENGINEER, METALLURGICAL ENGINEER

A. The regulations governing the Degrees of Master of Applied Science and Master of Architecture for the session 1928-29 shall be determined as follows:

1*a*. A candidate for the degree of Master of Applied Science shall hold the degree of Bachelor of Applied Science of this University or a degree from some other University recognized as equivalent by the Council of the School of Graduate Studies.

1*b*. A candidate for the degree of Master of Architecture shall hold the degree of Bachelor of Architecture or the degree of Bachelor of Applied Science in Architecture of this University or a degree from some other University recognized as equivalent by the Council of the School of Graduate Studies.

2. He shall register with the Secretary of the School of Graduate Studies at the beginning of the academic year.

3. Not later than November 1, 1928, he shall submit to the Secretary for acceptance by the Council of the School of Graduate Studies the title of his proposed thesis as approved by the department concerned.

4. Not later than April 30, 1929, he shall present evidence to the Council of the School of Graduate Studies that he has spent not less than one academic year of the department concerned as a student enrolled in one of the following departments on a course of study approved by the department: Civil Engineering, Mining Engineering, Mechanical Engineering, Architecture, Chemical Engineering, Electrical Engineering, Metallurgical Engineering.

5. Not later than April 30, 1929, evidence that the candidate has satisfactorily met all the requirements of the department with regard to thesis and to such examinations as the department shall require, shall be forwarded to the Council of the School of Graduate Studies through the sub-committee administering the regulations governing the degrees of Master of Applied Science and Master of Architecture.

B. The regulations governing the Professional Degrees of Civil Engineer (C.E.), Mining Engineer (M.E.), Mechanical Engineer (M.E.), Electrical Engineer (E.E.), Chemical Engineer (Chem.E.), Metallurgical Engineer (Met.E.), for the Session 1928-29 shall be determined as follows:

1. A candidate for one of the said degrees shall hold the diploma of the School of Practical Science or of the Faculty of Applied Science and Engineering or the degree of Bachelor of Applied Science, or shall have spent not less than two years as a member of the teaching staff in this Faculty after having graduated in Engineering from another institution of recognized reputation.

2. He shall have spent at least three years after receiving the diploma or the degree in the actual practice of the branch of engineering wherein he is a candidate for a degree.

3. Intervals of non-employment, or of employment in other branches of engineering, shall not be included in the above three years. It shall not be necessary that the several periods requisite to make up the said three years be consecutive.

4. Notice in writing shall be sent to the Secretary not later than the first day of November, informing him of the degree to which the candidate wishes to proceed and of the title of his proposed thesis for the approval of the Examiners.

5. Satisfactory evidence shall be submitted to the University Examiners as to the nature and length of the candidate's professional experience for the purpose of clauses 2 and 3, *i.e.*, a complete and detailed history of his professional activities from the date of graduation up to the time of application, stressing particularly that part of his experience that gave rise to his desire to prepare a thesis on the subject submitted for the approval of the University Examiners; together with certificate or certificates from former employers substantiating the statements as to the nature and duration of service enumerated.

The examiners may satisfy themeslves by oral or written examinations in regard to the candidate's experience and competence.

6. The candidate shall prepare an original thesis on some engineering subject in the branch in which he wishes a degree, the said thesis to be accompanied by all necessary descriptions, details, drawings, bills of quantities, specifications and estimates.

The candidate may be required at the option of the examiners to undergo an examination in the subject of this thesis.

7. The thesis, with accompanying papers, described in clause 6, shall be sent to the Secretary not later than the first day of March.

8. The candidate shall be required to present himself for examination in the month of April or at such time as may be arranged by the Examiners.

9. The thesis, drawings, and other papers submitted under clause 7 shall become the property of the University.

10. Nothing in this statute shall prevent any candidate from receiving more than one of the said degrees, provided he has the necessary qualifications for each degree. An interval of three years must elapse between the granting of any two degrees under this statute.

DEGREE OF DOCTOR OF PHILOSOPHY

Attention is called to the fact that the degree of Doctor of Philosophy (Ph.D.) is open to graduates of the Faculty of Applied Science and Engineering. Full information as to the conditions to be met by candidates for this degree will be found in the Calendar of the School of Graduate Studies, which may be obtained from the Registrar of the University.

In general this course involves, except under special circumstances, three years study in this University on one major subject and two minor subjects, and every possible effort will be made to meet the desires of candidates in the selection of these subjects.

Several graduates have already taken advantage of the opportunity thus offered, and others interested in this degree are requested to correspond with the Secretary of the School of Graduate Studies and are advised, in the first instance, to consult the Dean of this Faculty.

CERTIFICATE FOR HIGH SCHOOL ASSISTANT

The Calendar of the Ontario College of Education provides for the admission of the holder of a degree in Science to the Course for a High School Assistant's certificate. The regulation requires that the applicant shall submit with his application:

"His certificate of graduation as Bachelor or Master of Arts, Bachelor or Master of Science, Bachelor of Commerce, Bachelor of Agriculture, or Bachelor of Applied Science, from a British University, after the regular university course approved by the Minister of Education as to entrance requirements and as to content of the undergraduate courses. Each applicant must have Upper School or Honour Matriculation standing in English and History and Mathematics or the equivalent of such standing."

SPECIALISTS' CERTIFICATES FOR HIGH SCHOOL TEACHERS

By an arrangement between the University and the Department of Education of the Province of Ontario, provision is made for graduates of the Faculty of Applied Science and Engineering to obtain High School Specialists' Certificates under conditions which can be ascertained by reference to the Special Announcement of the University in connection therewith.

PROVISION FOR SPECIALIST STANDING IN SCIENCE IN FACULTY OF ARTS

A student in the Faculty of Applied Science and Engineering, who has passed the examination of the First and Second Years with honours in any one of the Departments of Civil, Mining, Mechanical, Chemical, Electrical and Metallurgical Engineering, may enter the Third Year of the Honour Course in Physics, provided that he has met the language requirements of the First Year of that course with respect to Latin, English, and French or German at the Honour Matriculation or equivalent examination.

LABORATORY EQUIPMENT

THERMODYNAMIC AND MECHANICAL LABORATORY

The University in 1919 completed the erection of a large, well-equipped building for the accommodation of the steam, gas, mechanical and hydraulic laboratories. A more complete description of the laboratories has been published elsewhere, so that the present description is only intended to give the main features.

The part of the building set apart for thermodynamics and other mechanical work is the ground floor of a room 60 ft. x 155 ft. This room is lighted entirely from the roof in a very perfect way. A part of the space 40 ft. wide running the entire length of 155 feet is served by a 3 ton travelling crane and contains the following equipment:

50 h.p. Brown engine with separate jackets on both heads and barrel of cylinder.

Two-stage Rand air compressor having compound steam cylinders, each fitted with Meyer cut-off gear. The low pressure air cylinder has Corliss inlet gear.

30 h.p. high-speed Leonard tandem compound engine with shaft governor.

15 h.p. high-speed McEwen engine.

40 h.p. Uniflow engine.

25 h.p. General Electric steam turbine.

Two 15 h.p. Leonard engines with different types of valves, which are used for valve setting.

There are also two surface condensers with air pumps so arranged that any engine in the laboratory may be made to exhaust into the atmosphere through an open heater or into one of the condensers, the change from one arrangement to the other being accomplished in a few minutes without the aid of valves.

The laboratory further contains:

A 3 ton York refrigerating machine with tanks.

An Amsler transmission dynamometer.

Apparatus for testing injectors and steam pumps.

Hot blast heating equipment.

Numerous other pieces of apparatus and instruments.

The work on internal combustion engines and producers is performed on the following:

Experimental gas producer.

14 h.p. National gas engine arranged for various compressions and points of ignition.

10 h.p. Fielding and Platt engine for city gas or coal oil, having various adjustments

25 h.p. Allen semi-Diesel engine.

25 h.p. tractor gasoline engine.

Six cylinder Buick automobile engine.

200 h.p. Sprague electric dynamometer.

Various accessories to above machines.

Steam for the laboratory is supplied by two 50 h.p. and one 100 h.p. Babcock and Wilcox boilers, the latter having an internal superheater. These boilers are located in a separate boiler room. They are used for experimental work only and are fitted up for testing. The gases pass up through two independent chimneys, and these have been arranged so that the draft and other conditions in the chimney at any point of its height may be examined.

In smaller work-rooms off the main laboratory are placed belt and oil testing machines, apparatus for testing the efficiency of gears and machines, and for experiments in the balancing of machinery.

HYDRAULIC LABORATORY

The hydraulic laboratory occupies two floors each 40 feet x 112 feet, which are well lighted by large windows on the side and end.

The water for the experimental work is pumped through the various pieces of apparatus from a well by means of two turbine pumping units, both of which are driven by a Belliss and Morcom compound engine of 125 h.p. running at a speed of 525 revs. per minute. Both engine and pumps have been installed with a view to using them in experimental work as well as for supply of water for other apparatus used in the laboratory.

The pumping units are capable of delivering one cubic foot of water per second against heads of 250 feet and 300 feet respectively. These units are designed and connected up so that they may be run in series giving the above discharge at 550 feet head, or they may be run in parallel giving double the discharge at a lower head. Each pumping unit consists of two two-stage pumps mounted on a common base and driven by a single pulley, and the construction and piping are such that each two-stage pump may be driven separately or that all may be driven at once, discharging separately one cubic foot per second at about 125 feet head through each of four independent pipes, or else the pumps may be run in series or in parallel. The scheme is thus well adapted to laboratory work, and under the heads used on reaction turbines about six cubic feet per second may be obtained.

In addition to this there is an electrically driven pump capable of delivering six cubic feet per second at a head of sixty-five feet and which is most helpful in turbine testing. Attention is called to the special turbine testing flume described below.

The laboratory further contains a large vertical steel tank 5½ feet diameter by 34 feet with arrangements for the attachment of nozzles

and other mouthpieces, etc. Connections are also arranged for reaction turbines, the tank acting as a reservoir.

The discharge from the turbines or nozzles is measured in a weir tank nearly 6 feet wide and 21 feet long, containing a contracted weir 4½ feet wide. This weir may be calibrated by two weighing tanks, each having a capacity of about 240 cubic feet.

There are three reaction turbines and two impulse wheels all ready for experiment, the power being measured by brakes and the water by weir or orifices. Amongst the reaction turbines may be mentioned the one designed and built by Escher Wyss & Co., specially for the laboratory.

A new and specially designed turbine testing flume has recently been added to the laboratory, the machinery for which has been largely furnished through the kindness of the Dominion Engineering Works, Montreal, and Wm. Cramp and Sons, Philadelphia. This flume is supplied with water by a Moody spiral pump of twelve cubic feet per second capacity and at present there are two turbines, one of the propeller type, and also two special draft tubes and more will be added. This provides an excellent opportunity for experiment and research.

Smaller orifice and weir tanks, each about 3 x 3 x 12 feet with necessary measuring tanks, are arranged for instruction in coeficients of various kinds and practice with weirs and orifices.

A Venturi meter and other meters, also an hydraulic ram and similar devices are available for testing, and good facilities have been arranged for investigating friction and other properties of pipes and fire hose.

For special investigations on turbine and centrifugal pumps, other pumps in addition to those already described have been arranged.

The basement of the laboratory contains an open trough 5 feet wide, about 110 feet long, with a large weir at one end. It is intended to use this trough for experiments on the flow in open channels, for measurements of large discharges by means of the weir, and for experiments with current meters and Pitot tubes.

Numerous pieces of smaller apparatus, together with all instruments required, have also been provided, and the laboratory equipment is believed to be very complete.

AERODYNAMIC LABORATORY

The Aerodynamic Laboratory is fully equipped with an improved 4-ft. Royal Aircraft Establishment type wind channel, aerodynamic balance, micromanometers and other necessary instruments.

Air speeds of 80 feet per second can be secured in a stream of great steadiness and uniformity and higher speeds with some sacrifice in steadiness.

The work done in the Laboratory includes the investigation of problems in aerodynamics, tests of air craft components, and complete machines, rating of meters, ventilators, radiators, etc., and the study of the effect of wind pressure on structures, chimneys, etc.

ENGINEERING PHYSICS LABORATORIES

Illuminating Engineering

The laboratories are equipped with ordinary and precision photometer benches with integrating mirrors and rotators, photometric spheres from 15 inches to 6 feet, portable illuminometers, spectro-phometer, etc. A room is also provided containing outlets for various types of industrial, commercial and house lighting units, for measurement of illumination values. For work in optics there is provided optical benches for the testing of lenses and instruction in the theory of instruments together with a general equipment of telescopes, field glasses, microscopes, sextants, etc.

Heat and Hydrostatic Laboratory

This laboratory is equipped with a full supply of apparatus required for the practical work in these subjects.

Acoustical Laboratory

The equipment here consists of forks, pipes, sonometers, etc., to illustrate the general work in this subject together with special equipment for work in architectural acoustics as taught to architects.

Donations

Through the generous donations of the manufacturers of lighting equipment and accessories, a Lighting Demonstration Room to illustrate the latest practice in industrial, commercial and house lighting has been established as a permanent exhibit. The following companies have co-operated and their contributions are gratefully acknowledged:

All-American Radio Corp.
Benjamin Electric Co.
Bryant Electric Co.
Canadian General Electric Co.
Canadian Westinghouse Co.
Consolidated Glass Co.
Cutler-Hammer Co.
Cutter Co. per D. M. Fraser Ltd.
Curtis Lighting Inc.
Frank Adam Electric Co. per Taylor Mfg. Co.
Gleason-Fiebout Glass Co.
Hart Mfg. Co. per Bongard Ltd., Ivanhoe Division.
Jewell Instrument Co. per D. M. Fraser Ltd.
Miller Co.
Pittsburg Reflector Co. per Wilson Illuminating Co.
Tallman Brass Co.
Walcott Mfg. Co. per Bongard Ltd.
Wheeler Co. per C.G.E.

PHOTOGRAPHIC AND PROJECTION LABORATORIES

The Photographic Laboratory contains a supply of small cameras for the use of students, enlarging cameras, printers, blue printing machine and the necessary dark rooms.

This Department also carries on a photographic and projection service for all Faculties and Departments of the University. The equipment for this work consists of cameras for making photographs up to full plate size, enlargers, photo-micrographic apparatus, motion picture cameras for both gross and micro work, with the necessary developing and printing machines, a rotary blue print machine, a photostat, etc.

For projection service there is a motion picture projector and a number of projection lanterns for service in any University Building.

ELECTRICAL LABORATORIES

The Department of Electrical Engineering is located in the Electrical Building. The accommodation includes quarters for staff, library, lecture rooms, laboratories, stores, and shop for repairs and construction.

Services.—Three-wire direct-current, 110 kw., from the University power house, automatically regulated at our end for constant voltage of desired value at our main switchboard. Three-phase, 60 cycles, 60 k.v.a., 115 volts, automatically regulated as to voltage and frequency. Three-phase, 25 cycles, 30 k.v.a., automatically regulated as to voltage and frequency. Every laboratory has all three services available at convenient places. There are three main boards, one for each floor. A system of special trunk lines between boards, and tree systems on each floor, enable easy arrangement of any desired special connections from any laboratory to any other.

Alternating current laboratory.—Area 26 x 110 ft., service sets 60 and 25 cycles, Tirrill regulators. Two 60-cycle and two 25-cycle, 15 k.v.a. motor-generator sets; converters; various motors, squirrel cage and wound rotor induction types, repulsion and other single-phase types, unity power factor motor, polyphase motor with variable speed shunt characteristics and speed range of 4 to 1; transformers, single and three-phase; constant-current transformers with load of series arc lamps; lamp racks, reactors, condensers, brakes, etc.; oscillographs; indicating, graphic, recording, and demand meters of the best makes; all arranged to facilitate a very general line of experimental work.

Direct current laboratory.—40 kw. 230 to 115 volt motor generator set with Tirrill regulator for special tests. Numerous 5 kw. to 10 kw. motor-generator sets; shunt, series, compound motors; special interpole machines; loading racks, dynamometers, rheostats, numerous meters of first quality, etc., for any sort of study.

Measurements Laboratory.—26 x 110 ft. Fitted with very flexible storage battery service which can be connected to any desired working place; d.c. three-wire service, also 60 and 25-cycle three-phase everywhere; galvanometers, resistance boxes, bridges, shunts, potentiometers, standard cells, bond testers, ductor, megger, apparatus for measuring low resistances, artificial lines for fault measurements, condensers, inductances, rails, cables, voltmeters, ammeters, wattmeters, dynamometers, etc., for general work on a great variety of measurements.

High voltage laboratory.—For various lines of study with voltages up to 200,000 volts. Flexible and safe provision for control.

Materials laboratories.—One specially fitted for general work on conducting materials, one for magnetic materials, one for dielectric materials.

Radio laboratory.—Adapted for the measurement of various quantities of interest in this work, including the strength of incoming signals. One single conductor aerial 1,000 ft. long, one multi-conductor aerial 120 ft. long.

Standardizing laboratories.—One students' calibration room for direct-current meters, another for alternating-current meters. A standards room, constant temperature, for master standards of voltage, resistance, current, power, etc.

Research laboratories.—Four rooms set apart for this work, in combination with facilities of the other laboratories.

Design laboratory—Arranged for calculation work on apparatus selected to illustrate essential principles.

CHEMICAL LABORATORIES

The Chemical laboratories are situated in the western half of the Chemistry and Mining building, on the first and second floors. The rooms are large and well lighted, and are supplied with the usual modern equipment.

The first and second year laboratory for qualitative work has accommodation for 112 students, each working space being supplied with water, gas and fume cupboard. The laboratory for quantitative analysis will accommodate 48 students, and is supplied with commodious fume cupboards and all necessary apparatus. A laboratory with working places for 36 is provided for the students engaged in the study of technical chemistry; it is equipped with appliances for the preparation and testing of chemical products. Laboratories for fourth year students with accommodation for twenty workers has been fitted up. Each of these laboratories has its own balance room adjoining furnished with instruments from the best makers and adapted to the particular objects in view.

In addition there are rooms set apart for research, for gas analysis, and a specially constructed fireproof laboratory for combustion, crucible and bomb furnaces. Each of these laboratories is supplied with apparatus of the most approved design, providing excellent facilities for the prosecution of work in analytical and technical chemistry.

A room in the basement, set apart for the purpose, has been equipped, as a laboratory for carrying on chemical operations on a small factory scale.

ELECTROCHEMICAL LABORATORIES

The Electrochemical laboratories, which are situated in the Chemistry and Mining building, are provided with special facilities for electrolytic work, including a large storage battery and electroplating dynamo with tanks as well as a good set of apparatus and electrical measuring instruments. The experimental work on electric furnaces is carried out in a large furnace room in the basement, occupied jointly by this Department and the Department of Metallurgy. The equipment for this purpose comprises a 120 KW, 110 volt generator supplying direct current through a switchboard, rheostats, circuit-breaker and instruments to a set of distributing bus-bars, and a 200 KV-a transformer stepping down from 2200 volts to 30-120 volts in 3 and 6 volt steps, which supplies alternating current at 25 cycles. There is a complete set of A.C. instruments, circuit-breakers, oil-switches, relays, automatic regulating winches, etc., and a Northrup high frequency furnace with its transformer is also installed.

ASSAYING LABORATORIES

These are situated in the west end of the basement in the Mining Building. They consist of five rooms, in addition to a library for study and an instructor's room. The East laboratory, 17 x 47 feet, and the West laboratory, 28 x 37 feet, are equipped with coal, oil, gas, and electric furnaces of various design. A Hoskin's electric resistance furnace has an automatic temperature regulator and a voltage control. Each room has a fume cupboard, and the necessary equipment for the wet work in connection with assaying. Accommodation for twenty-four students at a time is provided, by individual work desks, each supplied with a balance, weights, fluxes, tools, drawers and lockers. Common to both laboratories is the balance room which has a cement table on brick piers to support the bead balances. These are illustrative of the types met in practice. The latest model with a sensitivity of 1/500 milligram, is equipped with multiple weight attachment, and a mechanical pan extractor. Adjoining the West laboratory is a research room. A store-room adjoins the East laboratory where fluxes, clay ware and extra parts are kept. In the instructor's room are stored a large number of ores and bullion, obtained chiefly from typical mining districts and metallurgical plants, for class use. The preparation of ores is done in the Milling building, where crushers, pulverizers and sampling devices are available. A special laboratory sampler has been constructed for the purpose of giving samples for the student's assays, of indisputable similarity, thus confining variations in results to the students' work. Other apparatus includes Guess-Haultain stationary electrolytic outfits, King rotating electrolytic apparatus, microscopes, optical resistance and thermocouple pyrometers, hand and foot cupel machines, grinding plates and screens.

MINING AND ORE DRESSING LABORATORY

A detached building 72 ft. x 70 ft. contains the Mining and Ore dressing equipment. It is heated, lighted and supplied with power from the central plant. It is divided into several parts, the larger being 72 ft x 53 ft. by 22 ft. high.

In this room is a 5-stamp battery with amalgamation plates, Wilfley table, Deister Plat-o table, Deister slime table, buddle, and classifiers of sufficient size to make tests on lots of from one to ten tons.

In addition are a set of small Wilfley tables, two 3-compartment jigs, a 2 ft. x 3 ft. tube mill, a small experimental tube mill, agitators, small classifiers and other testing apparatus for experimenting on the falling rates of ore particles, slime settling, surface tension and flotation processes. These include a Case machine, a K. and K. machine, a Ruth machine, a Callow cell, etc. Water is supplied from a tank in the roof. The machinery is all motor driven.

One portion of the room is devoted to rock drills of various types and other mining apparatus.

The other part of the building, 72 ft. x 17 ft., is divided into several rooms and contains a Hadfield's Gyratory Crusher, 16 in. x 12 in. Rolls, small crushers, screening machine, and sampling apparatus. The crushers are driven by a 30 h.p. motor in another room.

The other rooms contain a Wetherill magnetic separator, screen sets, a smithing equipment, workshop and storage for small lots of ore. The larger part of the ore supply is accommodated in bins outside the building.

The plant throughout is intended mainly for teaching and experimental purposes.

There has recently been added apparatus especially designed for research work in various phases of rock crushing and grinding:—Ball Mills with plate glass ends for the study of ball paths; a small Ball and Rod Mill on ball bearings with dynamometer; a set of high grade miniature Rolls in ball bearings with integrating dynamometer.

METALLURGICAL LABORATORIES

This laboratory, in the East end of the Mining building, occupies about 3,600 sq. ft. on the basement floor and the same space immediately above on the ground floor. The basement floor is divided into one large furnace room, a small hydrometallurgical room and two store-rooms. The furnace room contains a motor driven Connersville blower, several gas fired furnaces, two small blast furnaces, and a small 6 hearth Wedge roasting furnace. The larger electric furnaces of the Department of Electrochemistry are in this room. Some are supplied with direct current, others with A.C. from a 200 K.V.A. transformer. A system of flues, with hoods

over all the furnaces, leads through a Cottrell precipitator of the Rathbun type taking current at 50,000 volts, to a stack through which gases are pulled by a fan in the attic.

The hydro-metallurgical room in addition to apparatus for leaching tests contains several natural draft furnaces, a large Hoskins resistance furnace and a 113 lb. drop hammer. There are also tanks for electrolytic refining and precipitation of metals.

The upper floor is divided into laboratories, store rooms and offices. The laboratories are: 1. Metallurgical analysis; 2. Heating treatment and pyrometry; 3. Grinding, polishing and etching; 4. Metallographic room with an adjoining dark room.

In the laboratory for metallurgical analysis the student is given some training in mill and smelter methods of analysis. It is well equipped for this work.

In the heat treatment and pyrometry laboratory are a number of tube furnaces of different sizes, a Leeds & Northrup transformation point indicator with furnace, double thermocouple and twin galvanometer, a Leeds & Northrup potentiometer pyrometer, a disappearing filament pyrometer, and many thermocouples for use with galvanometer or potentiometer. For grinding and polishing there is provided two motor driven emery wheels and a set of 3 motor driven horizontal polishing plates.

The Metallographic room is equipped with the latest type Bausch & Lomb horizontal inverted microscope type of photo micrographic apparatus, an older and horizontal photo micrographic instrument made by Pellin, Paris; two vertical photo micrographic instruments and three other metallographic microscopes.

There are also a Pellin instrument for the determination of critical points by photography according to the Saladin method and a Leeds & Northrup type "K" precision potentiometer, which is also used for the determination of critical points.

The laboratory has a Rockwell hardness testing machine, and a wire drawing bench.

The Ceramic equipment includes:

A dry pan and a vertical pug mill.

A small dry press.

A plunger machine with tile and hollow ware dies.

An Abbé six jar ball mill.

A recuperative down draft clay testing furnace of brick construction.

An oil fired muffle decorating kiln.

A small Seger test furnace.

A high temperature oxygen acetylene furnace.

Standard screens, volumeters, elutriation apparatus driers and such sundries as are necessary for clay testing.

MECHANICS OF MATERIALS LABORATORY

This laboratory is available for the scientific and commercial testing of materials of construction such as iron, steel, timber, concrete and masonry. It is supplied with the following:

An Emery 50-ton hydraulic machine, built by Wm. Sellers & Co., of Philadelphia, for making tests in tension and compression.

A 200 ton, three-screw power testing machine, built by Riehlé Bros., Philadelphia. It will make tests in tension, compression, shear and cross-bending, and will take posts 10 feet long and beams of 16 feet in span.

A Riehlé 100 ton screw power universal testing machine, taking posts 12 feet long and beams of 18 ft. span.

A Riehlé 10-ton screw power universal testing machine.

A Riehlé 50-ton screw power universal testing machine.

A Riehlé standard brick rattler.

A 15-ton single lever-machine, built by J. Buckton & Co., Leeds, England.

A torsion machine, built by Tinius Olsen & Co., Philadelphia, for testing the strength and elasticity of shafting. This machine will twist shafts up to 16 feet in length and 2 inches in diameter.

A hand power torsion machine of simple mechanical construction, specially designed for the testing of short shafts of a maximum diameter of one inch.

A Riehlé transverse testing machine of 5,000 pounds capacity, adapted to specimens up to 48 inches in length.

A Riehlé compressometer, with spherical seat attachment for the adjustment of specimens having slightly non-parallel faces. This compressometer will receive specimens up to 10 inches in length.

An Olsen compression micrometer of standard type.

A 20,000 pound Olsen, hand power, wire testing machine, specially fitted for testing wooden columns with both fixed and pivoted ends.

An Olsen combined tension and cantilever type impact testing machine.

An Olsen, 20,000 pound, hand power testing machine especially adapted for testing long columns.

An Olsen, 200 pound capacity, textile testing machine.

A Berry strain-gauge for spans of 2 inches and 8 inches.

A Nalder dividing engine. This may be used either for the precise division of scales or for the calibration of instruments intended for refined measurements.

A Brinell hardness testing machine.

A Shore scleroscope for testing hardness.

A Fereday-Palmer stress recorder by T. Cooke & Sons, Ltd., London.

Four Beggs deformeter gauges with necessary plugs and accessories for investigating stresses in structures by means of models.

A large number of extensometers of the usual degree of precision. These include the Bauschinger, Martens, Unwin, Ames, Riehlé, Johnson, Henning

(recording) and other types. In addition there are the usual scales, micrometers, telescopes and reflectors, voltmeters for the determination of metallic contact, and such other appliances as are necessary in the making of precise measurements.

The shop is equipped with a number of high-class machine tools specially fitted for reducing the specimens to the requisite shapes and dimensions with a minimum of hand labour. It is also supplied with the necessary appliances for making ordinary repairs and for making apparatus for special experiment and original investigation.

HIGHWAY LABORATORY

Road Metals and Subgrade Soils

This laboratory is equipped for carrying out investigations in the various materials employed in highway construction and maintenance, and comprises the following:

Page impact machine for testing the toughness of road materials.

Diamond core drill for preparing specimens for the toughness test.

Deval abrasion machine for testing the resistance to wear of road materials.

Cementation testing apparatus (Page type) for determining cementing properties of road materials.

Jaw crusher (Mitchell type) for crushing rock for various tests.

Power driven agitator with sieves for the mechanical analysis of sand, gravel and crushed rock.

Dorry hardness testing machine for determining the hardness of rock used in road construction.

Apparatus for determining the moisture equivalent, volumetric changes, capillary moisture, dye absorption and similar properties of subgrade soils.

Bitumens

This laboratory is designed for the investigation of the physical rather than the chemical properties of bitumens used in road construction and maintenance. The equipment consists of an extractor for separating bitumens and aggregates, an Engler viscosimeter, a penetration apparatus as well as appliances for determining melting point, volatilization, specific gravity, ductility, etc.

LABORATORY OF ONTARIO BOARD OF HEALTH

Through the courtesy of the Secretary of the Provincial Board of Health for Ontario the facilities of the excellently equipped laboratory which the Board maintains at Stanley Park have, with certain conditions, been placed at the service of the University for the investigation of problems of interest to the sanitarian and the sanitary engineer. The equipment consists of various types of sewage sedimentation tank, sewage filter, sewage measuring devices, aerators, sterilizing appliances and a complete and representative plant intended for the filtration and sterilization of water by practically all known methods.

CEMENT TESTING LABORATORY

This laboratory is fitted with all the ordinary moulds, sieves, balances, burettes, steaming and drying tanks, tables, and other appliances necessary in making the usual physical tests of a Portland cement. It is also supplied with completely equipped cabinets for individual work. In addition there are the following:

A 2,000 lb. Riehlé shot machine for tension.

A 2,000 lb. Fairbanks shot machine for tension.

A 1,000 lb. Olsen automatic shot machine fitted for tests in either tension or cross breaking.

An Olsen soapstone moist closet of modern design.

METROLOGICAL LABORATORY

The department of surveying and geodesy is provided with all the ordinary field instruments, such as transits, levels, compasses, micrometers, sextants, planimeters, plane tables, tapes, chains, etc., with which is carried on the instruction in practical field operations as detailed elsewhere.

A small laboratory is also established in the basement of the observatory described below, containing the necessary instruments for the refined measurements of geodetic surveying; as, a standard yard and metre, a Rogers 10-foot comparator, an invar base measuring apparatus, a Kater's pendulum with vacuum chamber, a level trier, micrometer microscopes, etc.

The geodetic observatory in connection with this department is used for the instruction of students of the Fourth Year in taking observations for time, latitude, longitude, and azimuth by the precise methods used in connection with a geodetic survey. It contains a 10-inch theodolite and zenith telescope by Troughton & Simms; an astronomical transit instrument and an 8-inch theodolite by Cooke; two electro-chronographs; a Howard astronomical clock; a Dent sidereal clock; a Dent sidereal break-circuit chronometer; a wireless receiving instrument; arithmometers, etc.

GEOLOGICAL AND MINERALOGICAL LABORATORIES

In the Chemistry and Mining building on College Street the University possesses a modern laboratory for Geology and Mineralogy.

Courses are given in laboratory work, especially in personal examination of type sets of rocks, fossils, minerals and crystal models. These laboratory exercises serve to illustrate the introductory didactic instruction.

For the encouragement of pure crystallography the laboratories are supplied with goniometers of the various types, crystal models, appliances for the cutting of oriented crystal sections and for the physical examination of the same. Practical petrography is carried on in rooms provided with type sets of rocks, both macroscopic and microscopic. Advanced students are taught to make thin sections of rocks and fossils and to study them

microscopically. For students in Mining a laborato y course in the interpretation of geological maps and sections is provided. Typical mining regions are studied in detail and an opportunity is afforded for the examination of specimens illustrating economic geology.

The laboratory for the preparation of thin sections of rocks, minerals and fossils is provided with electric diamond saws and grinding appliances for the various types of work incidental to the preparation of thin sections and museum material.

A room is also provided for advanced work in cartography and geological surveying.

The departments possess 28 petrological microscopes and 5 of other types, so that it is now possible to provide advanced students with instruments and sets of thin sections for their own especial use. The blowpipe laboratory contains 156 lockers, especially designed for apparatus for students. Provision is made for the study of opaque minerals in reflected light.

LIBRARY

The University Library is contained in a building of its own, situated on the east side of the campus, that lies to the south of University College. All students who have paid a library fee to the Bursar of the University are entitled to the privileges of the Library. Besides Reading Rooms the Building contains Departmental Studies, which may be used as study-rooms by honour students in the various branches and in which the Professors hold seminary courses, and private studies, intended for members of the Faculty or advanced students engaged in research work. The Library is opened at 8.45 every morning and remains open until 10 at night during the academic term. Books in ordinary use may not be taken out of the building during the daytime, but are lent for the night towards 5 p.m., to be returned the following morning before 10 o'clock. Books not in general demand may, on special application, be borrowed for a longer period. Failure to return a borrowed book at the proper time and other breaches of the regulations are punishable by fine or suspension from the privileges of the Library.

Rooms have been set apart in the Engineering, Mechanical, Chemistry and Mining and Electrical buildings for the housing of such periodicals and other literature of the University Library as is of special interest to the students of this faculty.

ROYAL ONTARIO MUSEUM

ARCHAEOLOGY, GEOLOGY, MINERALOGY, PALAEONTOLOGY, ZOOLOGY

Students of the University in all departments are recommended to avail themselves of the privileges of the Museum, which, although under separate control, is intimately connected with the work of the University.

The Museum is open on all week days from 10 a.m. to 5 p.m., and on Sundays from 2 p.m. to 5 p.m. The admission is free to the public on Tuesday, Thursday, Saturday and Sunday. On other days an admission fee of fifteen cents is charged.

By a resolution of the Board of Trustees all regular students of the University may be admitted free on all days of the week by presenting their card of registration.

UNIVERSITY OF TORONTO C.O.T.C.

The Toronto Contingent of the Canadian Officers Training Corps was organized in 1914, and is a unit of the non-permanent Active Militia. Its primary object is to provide students at Universities with a standardized measure of military training with a view to their qualifying for commissions in the country's auxiliary forces. C.O.T.C. Certificates of qualification exempt their holders from examination for commissioned rank on joining a militia unit in Canada, or, if resident in the British Islands, render them eligible for commissions in the Army Reserve of Officers, the Militia, or the Territorial Army.

The facilities which are offered by the contingent for obtaining a qualification while at the University, are intended to enable young gentlemen to give personal service to their country with the least possible interference with their civil careers, to ensure that units have their establishments complete in the junior commissioned ranks, and to build up an adequate reserve of scientifically trained officers who have completed a period of consecutive and systematic military training, on academic lines, of a nature calculated to produce good officers.

The contingent provides the practical work for students taking the Military Studies option for the Arts degree, as also physical exercise for students who may choose this as the form in which they will take their compulsory Physical Training. In addition to service in the corps for a University credit, students of any year or Faculty are trained in it to qualify for officers' certificates in the Artillery, Infantry, Engineers, Army Medical Corps and Signallers, writing on the examinations set by the War Office for members of O.T.C. contingents throughout the Empire.

There are at present four companies—in the Faculties of Arts, Medicine and Applied Science—and the training of each is so arranged that on leaving the University students are qualified for commissions in that branch of the Militia to which their University course particularly applied.

The present Headquarters are at 184 College Street, and include armouries, members' reading room, library, and lecture rooms.

The Contingent's Staff is:

Officer Commanding..Lieut.-Col. T. R. Loudon, late Can. Eng., B.E.F.
Second in Command.....................Major J. R. Cockburn, M.C.
Adjutant...................................Lieut. F. W. Bertram
Paymaster...................................Capt. T. A. Reed
Contingent Sergeant-Major..... S-M. W. Hunt, late Royal Welsh Fusiliers.

Officers of "C" (Applied Science) Company:

Officer Commanding....................Capt. W. J. T. Wright, M.B.E.

SOCIETIES

THE ENGINEERING SOCIETY OF THE UNIVERSITY OF TORONTO

The Society meets every second Wednesday during the academic year (except April), beginning with the second Wednesday in October. Addresses are given by prominent men on subjects of general interest.

The Society is divided into six clubs for the purpose of affording a medium of study of matters relating in particular to different branches of Engineering. Each of the Clubs holds its meetings at regular intervals. Papers are read and discussions held on engineering subjects.

The Society publishes an annual, called "Transactions," which contains the addresses given at the meetings and an account of the year's activities.

A Supply Department is conducted by the Society on a co-operative plan, through which instruments, draughting supplies, stationery, etc., can be purchased at a low cost.

ATHLETIC ASSOCIATION

The Athletic Association has full control over all athletic clubs using the name of the Faculty of Applied Science. The Executive Committee has power to suspend any one from the privileges of membership in the Association for any breach of its regulations, and controls the finances of all athletic clubs in the aforesaid Faculty. The annual membership fee of this Association is two dollars.

No other moneys are collected for the support of athletics in the Faculty of Applied Science without the sanction of the Executive Committee.

DEBATING CLUB

The Debating Club exists for the purpose of helping students to overcome their natural embarrassment when speaking in public and to that end holds weekly meetings during both terms, at which open debates take place after the manner of the Oxford Union.

THE INDUSTRIAL CHEMICAL CLUB

The object of the Chemical Club is to promote the study of industrial chemistry and chemical engineering. Illustrated lectures, preceded by an informal dinner and a short musical programme, are held fortnightly, and on the following day an excursion is made to industrial concerns located in the city or vicinity.

MECHANICAL AND ELECTRICAL ENGINEERING CLUB

The Club meets during the academic year for the discussion of papers relating to mechanical and electrical engineering problems.

CIVIL ENGINEERING CLUB

The Club is addressed during the academic year by practising engineers on modern methods and problems in civil engineering.

MINING AND METALLURGICAL CLUB

The Club is the official organization representing the undergraduates of Departments 2 and 8 of the Faculty of Applied Science.

The objects of the Club are to promote the spirit of good fellowship and mutual assistance amongst its members, both graduate and undergraduate, to provide a means of meeting together, and for the discussion of pertinent topics.

ARCHITECTURAL CLUB

The Architectural Club is addressed during the academic year by Architects and others on the latest works and developments in their profession.

STUDENT CHRISTIAN ASSOCIATION

The Student Christian Association carries on the work commenced by the Young Men's Christian Association in this Faculty in 1905. The aims of the Association are to develop true Christian manhood and to be of assistance to students.

The Association conducts bible study groups and lecture courses, as well as arranging conferences through the medium of the Office in Hart House, which it helps to maintain. As well as this Office for the Director, the Rev. F. J. Moore, the men's Associations maintain a library.

LODGING AND BOARD

Accommodation is readily obtainable in numerous private boarding-houses within a short distance of the University, at a cost of from ten dollars a week upwards and board obtained separately at about seven dollars per week. A list of accredited boarding-houses is kept by the Secretary of the Students' Administrative Council in Hart House and students are recommended to consult him with reference to the selection of suitable accommodation.

UNIVERSITY RESIDENCES

By the generosity of the late E. C. Whitney, Esq., Mrs. Whitney and friends, the University offers to one hundred and fifty men the advantages of residential life and excellent accommodation within its own grounds. The Residence consists of three Houses situated on the north side of Hoskin Avenue, opening upon a quadrangle, the fourth side of which is formed by Devonshire Place. They stand about two hundred yards to the north of University College and close to Hart House. The buildings are known as the South, East and North Houses.

Each House contains twenty-four single rooms, one single suite, and eleven suites, a suite comprising a study and two bedrooms. Two large rooms in each building each with an open hearth have been set aside as a common rooms. A lavatory, with hot and cold shower baths is provided for every eight men. The buildings are heated by steam and lighted by electricity.

The University supplies the table, chairs, book-case, chiffonier, bed, mattress, pillows, linen and window shades for each room; it is prepared to furnish a desk lamp for a nominal rental.

The rates are $4.00 per week for a single room or half of a suite, and $5.00 per week for a single suite. The rent is payable as follows: For the Michaelmas Term, when the key is issued; for the Easter Term up to April 1st, at the opening of the Easter Term; for the remainder of the Easter Term, April 1st. These charges cover heat, light, house-service and house-laundry. No rent is charged for a room during the Christmas vacation unless it is occupied. For this reason the University reserves the right to use during that period any unoccupied rooms. To cover local telephone service each student in residence will be required to pay the Bursar an Annual Fee of $2.00. There is no separate dining hall connected with the Residence, but board may be obtained at the adjacent University Dining Hall in Hart House.

Except under very special circumstances occupants who withdraw at any time during the session will be required to pay the full rent up to April 1st.

Applications for rooms must be made in writing to the Secretary of the Residence Committee (address the Registrar's Office) and must be accompanied by a deposit of $5.00. This deposit will be returned if the application be not granted, and will be forfeited if a room is assigned to the applicant and not taken by him, unless notice of his refusal of the room be received by the Secretary in writing before September 15th. It will be returned in full at the end of the College year if the room key be given back and the room and furniture left in a satisfactory condition. The following principles govern the allotment of rooms: (i) No student who, as a result of the annual Spring examinations, is not assured of being able to proceed to a subsequent year, will be admitted into the Residence. Exception to this rule will be made in the case of a student in the Faculty of Medicine who has obtained standing at the May examination, but is debarred by the rules of that Faculty from proceeding to the subsequent year until he has passed his Supplemental examinations. Such a student will be assigned a room provisionally, but cannot occupy it unless he passes his Supplemental examinations in September. (ii) The rooms in each House will be distributed among the various Faculties and Years. (iii) A limited number of rooms will be reserved for members of the incoming First Year until September 12th. (iv) Applications will be considered in order of priority.

The University lays down three general rules, designed to prevent hazing, the use of intoxicants and gambling. The students in each House shall elect a House Committee, which is entrusted by the University with the making and enforcing of any other needed rules and with the maintenance of order. A member of the Faculty resides in each House to act as friend and adviser to the men in residence.

SUMMARY OF STUDENTS REGISTERED

SESSION 1927-1928

	Department							
Year	1	2	3	4	6	7	8	Total
I	21	30	28	14	52	42	5	192
II	17	17	26	6	35	42	6	149
III	14	8	24	12	18	27	6	109
IV	19	10	20	7	14	26	4	100
	71	65	98	39	119	137	21	550

UNIVERSITY OF TORONTO

CALENDAR OF THE FACULTY

OF

APPLIED SCIENCE AND ENGINEERING

1929-1930

THE UNIVERSITY OF TORONTO PRESS

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1929 CALENDAR 1929

JANUARY

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	31
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

FEBRUARY

Sun.		3	10	17	24
Mon.		4	11	18	25
Tues.		5	12	19	26
Wed.		6	13	20	27
Thur.		7	14	21	28
Fri.	1	8	15	22	..
Sat.	2	9	16	23	..

MARCH

Sun.	3	10	17	24	31
Mon.	4	11	18	25	..
Tues.	5	12	19	26	..
Wed.	6	13	20	27	..
Thur.	7	14	21	28	..
Fri. 1	8	15	22	29	..
Sat. 2	9	16	23	30	..

APRIL

Sun.		7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	..
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

MAY

Sun.		5	12	19	26
Mon.		6	13	20	27
Tues.		7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	31
Sat.	4	11	18	25	..

JUNE

Sun.	2	9	16	23	30
Mon.	3	10	17	24	..
Tues.	4	11	18	25	..
Wed.	5	12	19	26	..
Thur.	6	13	20	27	..
Fri.	7	14	21	28	..
Sat. 1	8	15	22	29	..

JULY

Sun.		7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	31
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

AUGUST

Sun.		4	11	18	25
Mon.		5	12	19	26
Tues.		6	13	20	27
Wed.		7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	31

SEPTEMBER

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	..
Wed.	4	11	18	25	..
Thur	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

OCTOBER

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	31
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

NOVEMBER

Sun.		3	10	17	24
Mon.		4	11	18	25
Tues.		5	12	19	26
Wed.		6	13	20	27
Thur.		7	14	21	28
Fri.	1	8	15	22	29
Sat.	2	9	16	23	30

DECEMBER

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	31
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

1930 CALENDAR 1930

JANUARY

Sun.		5	12	19	26
Mon.		6	13	20	27
Tues.		7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	31
Sat.	4	11	18	25	..

FEBRUARY

Sun.		2	9	16	23
Mon.		3	10	17	24
Tues.		4	11	18	25
Wed.		5	12	19	26
Thur.		6	13	20	27
Fri.		7	14	21	28
Sat.	1	8	15	22	..

MARCH

Sun.	2	9	16	23	30
Mon.	3	10	17	24	31
Tues.	4	11	18	25	..
Wed.	5	12	19	26	..
Thur.	6	13	20	27	..
Fri.	7	14	21	28	..
Sat. 1	8	15	22	29	..

APRIL

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	..
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

MAY

Sun.		4	11	18	25
Mon.		5	12	19	26
Tues.		6	13	20	27
Wed.		7	14	21	28
Thur.	1	8	15	22	29
Fri.	2	9	16	23	30
Sat.	3	10	17	24	31

JUNE

Sun.	1	8	15	22	29
Mon.	2	9	16	23	30
Tues.	3	10	17	24	..
Wed.	4	11	18	25	..
Thur.	5	12	19	26	..
Fri.	6	13	20	27	..
Sat.	7	14	21	28	..

JULY

Sun.		6	13	20	27
Mon.		7	14	21	28
Tues.	1	8	15	22	29
Wed.	2	9	16	23	30
Thur.	3	10	17	24	31
Fri.	4	11	18	25	..
Sat.	5	12	19	26	..

AUGUST

Sun.	3	10	17	24	31
Mon.	4	11	18	25	..
Tues.	5	12	19	26	..
Wed.	6	13	20	27	..
Thur.	7	14	21	28	..
Fri. 1	8	15	22	29	..
Sat. 2	9	16	23	30	..

SEPTEMBER

Sun.		7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	..
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

OCTOBER

Sun.		5	12	19	26
Mon.		6	13	20	27
Tues.		7	14	21	28
Wed.	1	8	15	22	29
Thur.	2	9	16	23	30
Fri.	3	10	17	24	31
Sat.	4	11	18	25	..

NOVEMBER

Sun.	2	9	16	23	30
Mon.	3	10	17	24	..
Tues.	4	11	18	25	..
Wed.	5	12	19	26	..
Thur.	6	13	20	27	..
Fri.	7	14	21	28	..
Sat. 1	8	15	22	29	..

DECEMBER

Sun.		7	14	21	28
Mon.	1	8	15	22	29
Tues.	2	9	16	23	30
Wed.	3	10	17	24	31
Thur.	4	11	18	25	..
Fri.	5	12	19	26	..
Sat.	6	13	20	27	..

CALENDAR OF THE FACULTY OF APPLIED SCIENCE AND ENGINEERING, 1929-30

Michaelmas Term

1929—July 1	Monday	.....	Dominion Day. University Buildings closed.
Aug. 15	Thursday	....	Students, third year, Depts. 1 and 2, report at University Survey Camp.
Sept. 2	Monday	...	Labour Day. University Buildings closed.
Sept. 3	Tuesday	.....	Last day for receiving applications for Supplemental Examinations.
Sept. 7	Saturday	....	Students, fourth year, Dept. 1, Astronomy Option, report at Summer Survey Camp.
Sept. 18	Wednesday	..	Supplemental Examinations commence.
Sept. 23	Monday	.....	Registration in person of the first year from 9.00 a.m. to 5.00 p.m. Students, second, third and fourth years, Architecture, report at University Survey Camp.
Sept. 24	Tuesday	.....	Registration in person of the second, third and fourth years, from 9.00 a.m. to 5.00 p.m. Registration in person of the second, third and fourth years, Architecture, at the University Survey Camp. Preliminary instruction to first year. The Dean's address to the first year at 9.30 a.m. in the first year draughting room. Classification tests in first year. Meeting of Faculty Council.
Sept. 25	Wednesday	..	Lectures and Laboratory work commence.
Sept. 30	Monday	.....	Students, second, third and fourth years, Architecture, report at Toronto.
Oct. 1	Tuesday	.....	The opening address by the President to the students of all Faculties at 3.00 p.m. in Convocation Hall.
Oct. 2	Wednesday	..	Inaugural meeting of Faculty Council.
Oct. 5	Saturday	....	Stated meeting of the Caput to deal with requests as to social functions until November 15.
Oct. 11	Friday	......	Meeting of Senate.
Oct. 17	Thursday	....	Meeting of Faculty Council (Reports of Committees).
Oct. 18	Friday	......	Intercollegiate Track Meet. Neither lectures nor laboratory classes given after 1.00 p.m.

Oct. 21 Monday.....First meeting of Engineering Society.
Nov. 1 Friday......Meeting of Faculty Council.
Nov. 5 Tuesday.....Meeting of Engineering Society.
Nov. 8 Friday......Armistice Day. Service at the Soldiers' Tower at 12.15 p.m. Neither lectures nor laboratory classes given after 12.00 noon. Meeting of Senate.
Nov. 9-11 Saturday-Monday..Thanksgiving. Neither lectures nor laboratory classes given.
Nov. 20 Wednesday..Meeting of Engineering Society.
Dec. 2 Monday.....Meeting of Faculty Council.
Last day for receiving applications for Supplemental Examinations.
Dec. 5 Thursday....Meeting of Engineering Society.
Dec. 13 Friday......Meeting of Senate.
Dec. 20 Friday......Last day of lectures. Term ends at 5.00 p.m.
Dec. 25 Wednesday..University Buildings closed.

Easter Term

1930—Jan. 1 Wednesday..University Buildings closed.
Jan. 3 Friday......Mid-session examinations commence.
Easter Term begins.
Meeting of Faculty Council.
Jan. 10 Friday......Meeting of Senate.
Meeting of Engineering Society.
Jan. 24 Friday......Meeting of Faculty Council. (Examination results.)
Jan. 27 Monday.....Meeting of Engineering Society.
Feb. 3 Monday.....Meeting of Faculty Council.
Feb. 11 Tuesday.....Meeting of Engineering Society.
Feb. 14 Friday.......Meeting of Senate.
Feb. 27 Thursday....Meeting of Engineering Society.
Mar. 1 Saturday....Last day for receiving applications for Supplemental Examinations.
Mar. 3 Monday.....Meeting of Faculty Council.
Mar. 5 Wednesday..Meeting of Engineering Society.
Mar. 7 Friday......Annual Elections, Engineering Society.
Mar. 14 Friday......Meeting of Senate.
Mar. 17 Monday.....Annual General Meeting Engineering Society.
Apr. 1 Tuesday.....Meeting of Faculty Council.
Apr. 4 Friday......Easter Term ends. Lectures and laboratory work end at 1.00 p.m.
Apr. 9 Wednesday..Annual Examinations commence.
Apr. 11 Friday......Meeting of Senate.

Apr. 18 Friday......Good Friday. University Buildings closed.
May 1 Thursday....Meeting of Faculty Council.
May 9 Friday......Meeting of Senate.
May 24 Saturday....Victoria Day. University Buildings closed.
June 4 Wednesday..Meeting of Senate.
June 5-6 Thursday-Friday..University Commencement.

UNIVERSITY OF TORONTO

ADMINISTRATIVE OFFICERS OF THE UNIVERSITY

THE UNIVERSITY

President..................SIR R. A. FALCONER, K.C.M.G., D.LITT., LL.D., D.D., D.C.L., OXON.
Registrar..............................J. BREBNER, B.A., LL.D.
Bursar..................................F. A. MOURÉ, MUS. DOC.
Librarian................................W. S. WALLACE, M.A.
Superintendent of Buildings and Grounds........A. D'O. LE PAN, B.A.SC.
Director of Extension Work and Publicity...........W. J. DUNLOP, B.A.
Warden of Hart House.......................J. B. BICKERSTETH, M.A.
Director of University Health Service...............G. D. PORTER, M.B.
Medical Adviser for Women Students..MISS E. GORDON, B.A., M.B., D.P.H.
Manager of the University of Toronto Press.........R. J. HAMILTON, B.A.

FACULTY OF APPLIED SCIENCE AND ENGINEERING

President............................SIR R. A. FALCONER, K.C.M.G.
Dean of Faculty....C. H. MITCHELL, C.B., C.M.G., C.E., LL.D., D.Eng.
Secretary of Faculty.................W. S. WILSON, B.A.Sc., A.M.E.I.C.

E. A. ALLCUT, M.Sc. (Birmingham), M.I.Mech.E. 50 St. George St. 5
Associate Professor of Mechanical Engineering.
G. R. ANDERSON, M.A. (Tor. & Harvard), M.I.E.S., M.A.S.A. 7 Rose Park Cresc., 5
Professor of Engineering Physics and Photography
R. W. ANGUS, B.A.Sc., M.A.S.M.E. Mechanical Building 5
Professor of Mechanical Engineering.
E. G. R. ARDAGH, B.A.Sc., F.C.I.C. 80 Strathallan Blvd., 12
Associate Professor of Chemical Engineering.
E. R. ARTHUR, B.Arch., M.A. (Liverpool), A.R.I.B.A. 158 Albany Ave. 4
Associate Professor of Architecture.
J. W. BAIN, B.A.Sc., F.I.C. 393 Brunswick Ave. 4
Professor of Chemical Engineering.
E. W. BANTING, B.A.Sc. 101 Farnham Ave. 5
Associate Professor of Surveying.
M. C. BOSWELL, B.A.Sc., M.A. (Tor. & Harv.), Ph.D. Mining Bldg. 5
Professor of Organic Chemistry (in Chemical Engineering).
J. R. COCKBURN, M.C., B.A.Sc., M.E.I.C. 100 Walmer Rd. 4
Professor of Descriptive Geometry.

S. R. CRERAR, B.A.Sc., D.L.S. 122 Grenadier Rd. 3
Associate Professor of Surveying.

F C. DYER, B.A.Sc., M.E.I.C. 164 Colin Ave. 12
Associate Professor of Mining Engineering.

P. GILLESPIE, B.A.Sc., M.Sc. (McGill), C.E., M.E.I.C. 358 Davenport Rd. 5
Professor of Civil Engineering.

G. A. GUESS, M.A. (Queen's) Oakville, Ont.
Professor of Metallurgical Engineering.

W. S. GUEST, B.A.Sc. 30 McMaster Ave. 5
Assistant Professor of Electrical Engineering.

H. E. T. HAULTAIN, C.E. 156 Glencairn Ave. 12
Professor of Mining Engineering.

J. T. KING, B.A.Sc. 126 Manor Rd. E. 12
Associate Professor of Mining Engineering.

A. T. LAING, B.A.Sc. 146 Balmoral Ave. 5
Associate Professor of Highway Engineering.

T. R. LOUDON, B.A.Sc., M.E.I.C. 189 Sheldrake Blvd. 12
Professor of Applied Mechanics.

H. H. MADILL, B.A.Sc., M.R.A.I.C. 1344 Mount Pleasant Rd. 12
Associate Professor of Architecture.

J. W. MELSON, B.A.Sc. 69 Walmsley Blvd. 5
Assistant Professor of Surveying.

R. J. MONTGOMERY, B.Sc., Cer.E. (Ohio). 46 Atlas Ave. 10
Assistant Professor of Ceramics.

J. A. NEWCOMBE, B.Sc. (London), A.R.S.M. 5 Bloomfield Ave. 8
Assistant Professor of Metallurgy.

J. H. PARKIN, M.E., F.R.Ae.S. 12 Hudson Drive, 5
Associate Professor of Mechanical Engineering.

H. W. PRICE, B.A.Sc. 474 Palmerston Blvd. 4
Professor of Electrical Engineering.

T. R. ROSEBRUGH, M.A. 92 Walmer Rd. 4
Professor of Electrical Engineering.

W. J. SMITHER, B.A.Sc., M.E.I.C. 74 St George St. 5
Associate Professor of Structural Engineering.

L. B. STEWART, D.T.S. 38 St. Germain Ave., 12
Professor of Surveying and Geodesy.

R. TAYLOR, B.A.Sc. 4 Burnside Dr., 10
Assistant Professor of Mechanical Engineering.

J. E. TOOMER, B.S. (North Carolina State). Mining Building. 5
Assistant Professor of Metallurgy.

W. M. TREADGOLD, B.A. 13 Woodlawn Ave. E. 5
Associate Professor of Surveying.

C. H. C. WRIGHT, B.A.Sc., M.R.A.I.C. 419 Markham St. 4
Professor of Architecture.

W. J. T. WRIGHT, M.B.E., B.A.Sc. 126 Melrose Ave. 12
Assistant Professor of Engineering Drawing.
C. R. YOUNG, B.A.Sc., C.E., M.E.I.C. 98 Hilton Ave. 10
Professor of Structural Engineering.
A. R. ZIMMER, B.A.Sc. 80 Pine Crest Rd. 9
Associate Professor of Electrical Engineering.

SESSIONAL APPOINTMENTS

B. DE F. BAYLEY 64 Gloucester St. 5
Special Instructor in Radiotelegraphy.
G. P. BEAL, B.A.Sc. 68 Lakeview Ave. 3
Demonstrator in Chemical Engineering.
K. H. BRAITHWAITE, B.A. West., B.A.Sc. 103 Madison Ave. 5
Demonstrator in Chemical Engineering.
R. J. BROWN, B.A.Sc. 21 Glen Gordon Rd. 9
Instructor in Electrical Engineering.
W. M. CAMPBELL, B.A.Sc. 162 Inglewood Dr. 5
Demonstrator in Hydraulics.
A. R. CLUTE, B.A., LL.B. 47 Elgin Ave. 5
Special Lecturer in Limited Companies and Commercial Law.
F. COATES, A.R.C.A. Scarboro Bluffs P.O.
Instructor in Modelling.
T. L. CROSSLEY 28 Lonsdale Rd. 5
Special Lecturer in Pulp and Paper.
A. V. DELAPORTE, B.A.Sc. 5 Millerson Ave. 10
Instructor in Sanitary Chemistry.
W. B. DUNBAR, B.A.Sc., A.M.E.I.C. 241 Glebeholme Blvd. 6
Lecturer in Engineering Drawing.
H. B. DUNNINGTON-GRUBB, B.S.A. (Cornell) 4 St. Thomas St. 5
Special Lecturer in Landscape Architecture.
G. R. EDWARDS, B.A.Sc. 1263 King St. W. 2
Demonstrator in Engineering Drawing.
R. R. GRANT 21 King St. E. 2
Special Lecturer in Accountancy and Business.
T. J. GRANTON, B.A.Sc. 583 Spadina Ave. 4
Demonstrator in Hydraulics.
G. M. GRAY 44 Roxborough St. W. 5
Demonstrator in Engineering Physics.
W. H. GREAVES, M.A. (Bost.) Victoria Coll. 5
Special Lecturer in Public Speaking.
G. H. HARLOW, B.A.Sc. 123 Braemore Gardens 10
Instructor in Mechanical Engineering.
L. A. HOWARD, B.A.Sc. 62 Inglewood Dr. 5
Demonstrator in Engineering Drawing.

W. J. HVILIVITZKY, B.A.Sc. 53 Charles St. E., 5
Demonstrator in Engineering Drawing.
K. B. JACKSON, B.A.Sc. 365 Hillsdale Ave., E. 12
Lecturer in Engineering Physics and Photography.
C. W. JEFFERYS, R.C.A., O.S.A. York Mills
Instructor in Painting.
P. V. JERMYN, B.A.Sc., M.E.I.C. 109 Cluny Dr. 5
Instructor in Engineering Drawing.
G. J. KLEIN, B.A.Sc. 694 Bathurst St. 4
Demonstrator in Machine Design.
R. E. LAIDLAW, B.A.Sc. 77 Glendonwynne Rd. 9
Special Lecturer in Engineering Law.
MISS J. C. LAING, B.A. 221A St. Clair Ave. W. 5
Instructor in History and Librarian in Dept. of Architecture.
W. C. MACDONALD, B.A.Sc 184 Glen Rd. 5
Demonstrator in Chemical Engineering.
H. L. MCCLELLAND, B.A.Sc. Cooksville
Demonstrator in Mining Engineering.
W. H. MCCULLOUGH, B.A.Sc. 524 Crawford St. 4
Demonstrator in Electrical Engineering.
R. J. MCGRATH, B.A.Sc. 58 Triller Ave. 3
Demonstrator in Applied Mechanics.
W. G. MCINTOSH, B.A.Sc. 360 Rosewell Ave. 12
Lecturer in Machine Design.
C. A. MORRISON, B.A.Sc. 164 Indian Road Cres. 9
Demonstrator in Engineering Physics and Photography.
C. F. MORRISON, B.A. (Sask.), M.Sc. (McG.) 550 Spadina Ave. 2
Lecturer in Civil Engineering.
S. R. PAISLEY, B.A.Sc. 627 Glebeholme Rd. 6
Demonstrator in Electrical Engineering.
D. S. PASTERNACK, B.Sc. (Qu.), M.Sc. (Mc.G.), Ph.D. (McG.), 345 Huron St., 5
Demonstrator in Electrical Engineering.
A. R. PHIPPS Richmond Hill
Demonstrator in Thermodynamics.
R. E. RICHARDSON, B.A.Sc. 103 St. Clair Ave. W. 5
Demonstrator in Chemical Engineering.
C. P. ROBINS, B.A.Sc. 57 Roxborough St. W. 5
Demonstrator in Engineering Drawing.
W. L. SAGAR, B.A.Sc., A.M.E.I.C. 306 Jarvis St. 2
Instructor in Applied Mechanics.
F. E. SIMPSON. 14 Lakeview Ave. 3
Assistant in Modelling.
E. A. SMITH, M.A. 216 Sheldrake Blvd. 12
Lecturer in Chemical Engineering.
V. G. SMITH, B.A.Sc. Apt. B1, 569 Broadview Ave. 6
Lecturer in Electrical Engineering.

J. J. SPENCE, A.M.E.I.C. — 162 Glencairn Ave. 12
Instructor in Engineering Drawing.

W. R. SPITTAL, B.A.Sc. — 12 Radford Ave. 3
Demonstrator in Electrical Engineering.

H. R. SWITZER, B.A.Sc. — 62 Melbourne Ave. 3
Demonstrator in Engineering Drawing.

R. T. WAINES, B.A.Sc. — 43 Albertus Ave. 12
Instructor in Machine Design.

A. WARDELL, B.A.Sc. — 122 Melrose Ave. 12
Instructor in Engineering Drawing.

R. A. WESTERVELT — Clarkson
Demonstrator in Thermodynamics.

I. WEINERT, B.A.Sc. — 108 Augusta Ave. 2
Demonstrator in Electrical Engineering.

W. WILCOCK — 1083 Bloor St. W. 4
Demonstrator in Electrical Engineering.

A. C. WILSON, B.A.Sc. — 283 Evelyn Ave. 9
Instructor in Engineering Drawing.

S. E. WOLFE, B.A.Sc. — Cooksville
Demonstrator in Mining Engineering.

MEMBERS OF OTHER FACULTIES GIVING INSTRUCTION TO STUDENTS IN APPLIED SCIENCE

S. Beatty, M.A., Ph.D., *Professor of Mathematics.*	537 Markham St. 4
M. A. Buchanan, B.A., Ph.D., *Professor of Italian and Spanish.*	75 Heathdale Road 10
J. T. Burt-Gerrans, Phm.B., M.A., Ph.D. *Associate Professor of Electrochemistry.*	46 Dewson St. 4
A. T. DeLury, M.A., *Professor of Mathematics.*	74 St. Albans St. 5
G. H. Duff, M.A., Ph.D. *Assistant Professor of Plant Physiology.*	37 Summerhill Gardens 5
B. Fairley, M.A., Ph.D., *Associate Professor of German.*	197 Dawlish Ave. 12
C. R. Fay, M.A., D.Sc., *Professor of Economic History.*	374 Brunswick Ave. 4
J. B. Ferguson, B.A. *Associate Professor of Chemistry.*	511 Christie St. 10
J. G. Fitzgerald, M.D., *Professor of Hygiene and Preventive Medicine.*	186 Balmoral Ave. 5
D. T. Fraser, M.B., D.P.H., *Assistant Professor of Hygiene and Preventive Medicine.*	190½ Lowther Ave. 4
T. Hedman, Ph.B., *Assistant Professor of German.*	Old Forest Hill Road
G. E. Holt, M.A., Mus.Bac., *Assistant Professor of German.*	20 Nanton Ave. 5
F. C. A. Jeanneret, B.A., *Professor of French.*	70 St. Alban's St. 5
F. B. Kenrick, M.A., Ph.D., *Professor of Chemistry.*	77 Lonsdale Road 5
W. J. Loudon, B.A., *Professor of Mechanics.*	9 Woodlawn Ave. E. 5
J. W. MacArthur, M.A., Ph.D., *Assistant Professor of Genetics.*	319 Roehampton Ave. 12
M. A. Mackenzie, M.A., F.I.A., *Professor of Mathematics.*	1 Bellwoods Park 3
A. MacLean, B.A., *Associate Professor of Geology.*	119 Balmoral Ave. 5
W. L. Miller, B.A., Ph.D., *Professor of Physical Chemistry.*	8 Hawthorne Ave. 5
E. S. Moore, M.A., Ph.D. *Professor of Economic Geology.*	16 Indian Grove 3

G. H. NEEDLER, B.A., Ph.D., *Professor of German.*	103 Bedford Road 5
W. A. PARKS, B.A., Ph.D., *Professor of Geology.*	69 Albany Ave. 4
A. L. PARSONS, B.A., *Associate Professor of Mineralogy.*	79 Oriole Road 5
I. R. POUNDER, M.A., Ph.D., *Associate Professor of Mathematics.*	19 Glen Gordon Rd. 9
D. A. F. ROBINSON, M.A. *Assistant Professor in Mathematics.*	182 University Ave. 2
L. J. ROGERS, B.A.Sc., M.A., *Associate Professor of Chemistry.*	110 Garfield Ave. 5
H. B. SPEAKMAN, M.Sc., *Associate Professor of Zymology.*	61 Walmsley Blvd. 5
J. E. THOMSON, B.A.Sc. *Associate Professor of Mineralogy.*	32A Prince Arthur Ave. 5
T. L. WALKER, M.A., Ph.D., *Professor of Mineralogy and Petrography.*	20 Avondale Ave. 5
R. K. YOUNG, B.A., Ph.D. *Associate Professor of Astronomy.*	96 Isabella St. 5

SESSIONAL APPOINTMENTS

G. L. ASSIÉ, B.ès Sc. *Assistant in French.*	46 Isabella St. 5
W. A. BLACK, B.Sc. Acad. *Assistant in Electrochemistry.*	556 Spadina Ave. 5
C. W. DELOREY, B.Sc., St. F.X. *Assistant in Electrochemistry.*	St. Michael's College 5
D. R. DERRY, M.A. *Class Assistant in Geology.*	88 Prince Arthur Ave. 5
MISS E. V. EASTCOTT, M.A., Ph.D. *Assistant in Chemistry.*	84 Queen's Park. 5
W. A. JONES, M.A.Sc., B.C., M.A. *Demonstrator in Mineralogy.*	300 Huron St. 5
J. M. KANE, B.Sc., Pitt. *Assistant in Chemistry.*	85 Baldwin St. 2
MISS J. C. LAING, B.A. *Instructor in History and French.*	221A St. Clair Ave W. 5
M. POIRIER, L. ÈS L., Dip. d'Et. Sup. *Lecturer in French.*	69 Breadalbane St. 5
D. F. STEDMAN, B.Sc., B.C., Ph.D. Lond. *Assistant in Electrochemistry.*	91A Isabella St. 5

E. H. SMITH, B.A. — 95 Chudleigh Ave. 12
Assistant in Chemistry.

J. E. THOMSON, B.A. — 78 Grosvenor St. 5
Class Assistant in Ceology.

A. W. TUCKER, B.A. — 195 Glendonwynne Rd. 9
Fellow in Mathematics.

MISS H. M. WICKWARE, B.A. — 40 Bedford Rd. 5
Lecturer in Spanish and Italian.

FACULTY OF APPLIED SCIENCE AND ENGINEERING

Historical Sketch

The Legislative Assembly of the Province of Ontario during the Session of 1877 gave its sanction to the establishment of a School of Practical Science on the basis proposed in the memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council on the 3rd day of February, 1877.

By the scheme thus approved the Government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the department of science, above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction of the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor on the 30th day of October, 1889.

By an Order-in-Council, approved by the Lieutenant-Governor on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School. By the terms of this order the management and discipline of the School was vested in the Council.

On December 14th, 1900, the Senate by Statute, subsequently approved by the Lieutenant-Governor in Council, established a Faculty of Applied Science and Engineering but without assuming any liability for its support or maintenance. Under this Statute the teaching Staff and Examiners of the School of Practical Science became the teaching Staff and Examiners of the Faculty, although the University retained the right to appoint the Examiners for the Bachelor of Applied Science and professional degrees. By the University Act of 1906 the School of Practical Science became the Faculty of Applied Science and Engineering of the University of Toronto.

On April 8th, 1892, the Senate of the University established the Degree of B.A.Sc., which was open to those who held the Diploma of the School and were prepared to devote a fourth year to advanced work. In the Session 1909-1910 a new Course extending over four years and leading to the Degree of B.A.Sc. came into operation, taking the place of the long established Diploma Course of three years, which came to an end in the Session 1910-1911.

MATRICULATION

A candidate for admission to the First Year in the Faculty of Applied Science and Engineering must produce satisfactory certificates of good character and of having completed the seventeenth year of his age on or before the first of October of the year in which he proposes to register.

He must also present certificates giving him credit in the following subjects of Pass and Honour Matriculation:

PASS MATRICULATION

ENGLISH (Literature and Composition)
HISTORY (Canadian and Ancient) *or*
CANADIAN HISTORY and MUSIC
MATHEMATICS (Algebra and Geometry)
Any three of:
- LATIN (Authors and Composition)
- GREEK (Authors and Composition)
- FRENCH (Authors and Composition)
- GERMAN (Authors and Composition)
- SPANISH (Authors and Composition) *or* ITALIAN (Authors and Composition)
- EXPERIMENTAL SCIENCE (Physics and Chemistry) *or* AGRICULTURE (Parts I and II)

*ARITHMETIC *and* Certificates in MECHANICAL DRAWING and SHOP WORK from the Principal of the School, accompanied by an approving certificate from the Director of the Technical School Branch of the Department of Education for Ontario.

HONOUR MATRICULATION

(At least 50%)

ENGLISH (Literature and Composition).
MATHEMATICS (Algebra, Geometry and Trigonometry).
PHYSICS
One of:
- LATIN (Authors and Composition).
- GREEK (Authors and Composition).
- FRENCH (Authors and Composition).
- GERMAN (Authors and Composition).
- SPANISH (Authors and Composition).
- ITALIAN (Authors and Composition).

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*This option applies to students—and to such students only—who have been in attendance at and matriculate from a Technical School in the Province of Ontario and certified as such by the Department of Education of the Province.

In selecting the options it is recommended that students take French, German and Experimental Science. In the Department of Architecture, French is recommended; in the Departments of Chemical Engineering and Mechanical Engineering it is desirable that students take German. For students intending to take Metallurgical Engineering, Spanish and Experimental Science are recommended.

The regulations respecting Matriculation, together with a schedule of examinations which may be accepted as equivalent, may be found in the Curriculum for Matriculation on application to the Registrar of the University.

A candidate from the British Isles must present a certificate showing that he has passed or has exemption from the Preliminary Examination of the Institution of Civil Engineers.

ADMISSION

Applications for admission must be made in duplicate on blank forms supplied by the Registrar, and should be forwarded as early as possible to the Registrar of the University, together with all Pass and Honour Matriculation or equivalent certificates.

By order of the Board of Governors, every candidate for admission must submit a certificate of successful vaccination with his or her application, or agree to submit such certificate within ten days after the opening of the session. Dr. Porter and Dr. Edith Gordon of the University Health Services will arrange for the vaccination of those who so desire.

Applications based upon certificates other than those mentioned will be considered as occasion may require. Such certificates must be accompanied by an official statement of the marks in the various subjects upon which the certificate was granted.

ADMISSION *AD EUNDEM STATUM*

An undergraduate of another University may be admitted *ad eundem statum* on such conditions as the Senate on the recommendation of the Council of the Faculty may prescribe.

An applicant for admission *ad eundem statum* must submit with his petition (1) a calendar of his University giving a full statement of the courses of instruction; (2) an official certificate of character and academic standing.

REGISTRATION

Students in any year will be required to register in person on the date specified in the Calendar for the registration of students in that year. Those who present themselves on subsequent days must petition the Council to be allowed to register. Every petition for registration subsequent to the said date must be accompanied by a sum of money reckoned at one dollar per diem for each day thereafter. For sufficient cause the whole or part of such a sum may be refunded.

Council reserves the right to reject applications of, or impose penalties upon, those who fail to report on the dates specified. It is important that students should be in attendance in the laboratories and at lectures from the date of registration.

ENQUIRIES

Enquiries with reference to requirements of admission to the Faculty of Applied Science and Engineering are to be addressed to the Registrar of the University.

Communications relating to curricula, instruction, examinations and standing therein, in the Faculty of Applied Science and Engineering are to be addressed to the Secretary of the Faculty.

DEGREES

Degree of Bachelor of Applied Science (B.A.Sc.)
Degree of Bachelor of Architecture (B.Arch.)

There are six graduating Departments leading to the Degree of Bachelor of Applied Science (B.A.Sc.) and one Graduating Department leading to the Degree of Bachelor of Architecture (B.Arch.), viz.,

1. Civil Engineering.
2. Mining Engineering.
3. Mechanical Engineering.
4. Architecture.
5. (Discontinued.)
6. Chemical Engineering.
7. Electrical Engineering.
8. Metallurgical Engineering.

Prescription of the courses in these Graduating Departments are given on pages 47, 52, 55, 59, 62, 65 and 68.

In the fourth year, optional courses are arranged in certain departments. Students are required to submit their selection, in writing, to the Secretary not later than September 15th. The proposed selection must be approved by Council before adoption.

Degree of Master of Applied Science (M.A.Sc.)
Degree of Master of Architecture (M.Arch.)

Graduates holding the Degree of B.A.Sc. of this University or those holding the degree of another University recognized as equivalent, may take post-graduate work proceeding to the Degree of Master of Applied Science (M.A.Sc.). (For requirements, see page 119.)

Graduates holding the Degree of B.Arch. or B.A.Sc. in Architecture of this University, or those holding the Degree of another University recognized as equivalent, may take post-graduate work proceeding to the Degree of Master of Architecture (M.Arch.). (For requirements, see p. 119.)

Professional Degrees

Graduates in Applied Science and Engineering, graduates of the School of Practical Science and any others who, having graduated in Engineering from another institution of recognized reputation, have spent not less than two years as members of the teaching staff in this Faculty, may, after three years spent in professional work, present themselves for the degrees of Civil Engineer (C.E.), Mining Engineer (M.E.), Mechanical Engineer (M.E.), Electrical Engineer (E.E.), Chemical Engineer (Chem.E.), Metallurgical Engineer (Met.E.), as the case may be, subject to the rules and regulations established by the University.

FEES

All fees are payable at the Bursar's office between the hours 10 a.m. and 1 p.m. of each week day except Saturday (or may be remitted by mail).

The annual fees, including tuition, library, laboratory supplies and one annual examination for each year, shall be as follows:

If paid in full on or before November 5th	$200.00
If paid by instalments.—	
First instalment, if paid on or before November 5th	100.00
Second instalment, if paid on or before February 5th	103.00

Repeating a year—The fees shall be the same as the foregoing.

The above fees are payable in advance. After November 5th a penalty of $1.00 per month will be imposed until the whole amount is paid. In the case of payment by instalments the same rule as to penalty will apply.

Students must have paid the fees due in the first term before proceeding to the work of the second term.

GENERAL FEES

Matriculation, or registration of Matriculation	$ 5.00
Supplemental examination	10.00
Admission *ad eundem statum*	10.00
Degree of B.A.Sc. (Payable Apr. 1st)	10.00
Degree of B. Arch. (Payable Apr. 1st)	10.00
Physical Training (see page 24)	5.00
Supplemental Physical Training (see page 24)	10.00
Hart House (see below)	10.00
Students' Administrative Council (see page 24)	4.00

DUES AND DEPOSITS

All dues and deposits are payable at the office of the Faculty at the time of Registration. Cheques must be made out in favour of "Faculty of Applied Science and Engineering".

Engineering Society membership	$2.00
Athletic Association membership	2.00
Annual deposit, Departments 1, 3, 4, 7	3.00
Departments 2, 6, 8	8.00

Charges for waste, neglect and breakage are to be met out of the deposit fee, the balance of which will be refunded to the student at the end of the session on application to the Secretary.

If the foregoing deposits do not cover the cost of breakage due to carelessness or neglect, the balance shall be paid by the student to the Secretary.

HART HOUSE FEE

Every male student in attendance, proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering, is required to pay to the Bursar on or before November 15th the annual fee of ten dollars for the maintenance of Hart House. If this fee is not paid by the above date a penalty of two dollars will be imposed, making the total fee twelve dollars.

STUDENTS' ADMINISTRATIVE COUNCIL FEE

Every student in attendance, proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering, is required to pay to the Bursar at the time of the entry of his name with the Secretary the annual fee of four dollars for the support of the Students' Administrative Council.

PHYSICAL TRAINING FEE

Every male student in attendance proceeding to a Bachelor's Degree in the Faculty of Applied Science and Engineering is required to pay to the Bursar the annual Physical Training fee of $5.00 at the opening of each session in which Physical Training is compulsory for that student.

A student who has failed to complete satisfactorily the course in Physical Training prescribed for the First Year will not be permitted to register in the Third Year; and the student who has failed to complete satisfactorily the course in Physical Training prescribed for the Second Year will not be permitted to register in the Fourth Year.

Every student who has neglected to complete satisfactorily the course in Physical Training of the First or Second Year, and who must take this work during the Second or Third Year respectively of his course, will be required to pay to the Bursar at the opening of the session a Supplemental Fee of $10.00, in addition to the prescribed Physical Training fee.

SCHOLARSHIPS AND PRIZES

Through the generosity of friends of the University, encouragement has been given to both undergraduate and graduate work in the various branches, by establishing the following scholarships and prizes:

Name of Scholarship	Years Eligible	Amount	Described on page
Mrs. M. W. Baptie	I	$100	25
Harvey Aggett Memorial	II	$ 75	26
Boiler Inspection & Insurance Co.	III	$150	26
Jenkins Brothers, Limited	III	$100	26
B.A.A.S. Medal	IV	....	26
Toronto Architectural Guild Medal	IV	....	26
Ontario Association of Architects Scholarship	II	$100	27
Darling and Pearson Prize	V	$100	27
Mathers and Haldenby Prize	III	$25	27
Toronto Brick Company Prizes	III	$75 & $25	27
C. J. Rhodes	II, III, IV	£300	27
Khaki University & Y.M.C.A.	II, III, IV	Loans	30
Jardine Memorial	All	$100	30
S. Ubukata	All	....	31
F. W. Jarvis Bursaries	All	$50	31
U. of T. War Memorial	All	$250	31
Æneas McCharles	All & Grad.	$1,000	32
1851 Exhibition	Graduate	£250	33
Nipissing Mining Co.	Graduate	$1,100	35

THE BAPTIE SCHOLARSHIP

The Baptie Scholarship is derived from a bequest under the will of the late Mrs. Margaret W. Baptie, of Ottawa, and the Board of Governors has directed that from the income therefrom a scholarship of One Hundred Dollars shall be awarded for Engineering students on the record of their first year. . . . The Board of Governors also authorizes a remission of fees in the case of the holder of the scholarship up to Seventy-five Dollars.

The conditions of the award are as follows: That the scholarship be awarded to the student who, in the Annual Examinations of the First Year, enrolled in any one of the departments of Civil Engineering, Mining Engineering, Mechanical Engineering, Chemical Engineering, Electrical Engineering or Metallurgical Engineering, obtains the highest aggregate percentage of marks in those subjects which are common to the First Year curricula of those departments. The first award was made on the results of the annual examinations of the Session 1925-26.

HARVEY AGGETT MEMORIAL SCHOLARSHIP

This scholarship was donated by Mr. J. T. Aggett, of Toronto, as a perpetual memorial to his son, the late Lieutenant Harvey Aggett, who enlisted in March, 1915, during his second year in this Faculty, and was killed in action at Passchendaele on 6th November, 1917.

This annual scholarship of the value of seventy-five dollars is to be awarded to a student of the second year in this Faculty who, obtaining honours and being one of the first three in his year by his standing at the annual examinations, has been adjudged highest of the three in general student activities and service in the University during his period of attendance.

BOILER INSPECTION AND INSURANCE COMPANY SCHOLARSHIP

The Boiler Inspection and Insurance Company of Canada offers a Scholarship in the Department of Mechanical Engineering of the value of $150.00 to the student who obtains highest Honour Standing in the regular examinations of the third year.

The successful candidate will be expected to proceed to his fourth year during the session next following the date of the award.

The amount of the award will be credited by the Bursar to the fees of the fourth year of the successful candidate.

JENKINS SCHOLARSHIP IN ENGINEERING

The Jenkins Scholarship in Engineering, presented by Jenkins Bros., Limited, has been donated to continue for a period of ten years, the first award having been made in 1925.

This annual scholarship, of the value of One Hundred Dollars, is to be awarded to the student of the third year registered in one of the six departments of Civil, Mining, Mechanical, Chemical, Electrical or Metallurgical Engineering, who has the highest aggregate of percentages for the first, second and third years.

MEDAL FROM MEMBERS OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

A Bronze Medal has been donated for students of the Faculty of Applied Science and Engineering by members of the British Association for the Advancement of Science. This Medal will be awarded to the student of the Fourth Year, in any department, who, taking honours, obtains the highest aggregate percentage in practical and written examinations in the year.

TORONTO ARCHITECTURAL GUILD MEDAL

The Toronto Architectural Guild was the organization of local architects from which sprung the Ontario Association of Architects. When the

new and wider association became firmly established, the Guild disbanded and handed over to a trustee board certain funds for the establishment of a Medal to be awarded in the Department of Architecture of the University of Toronto.

The Trustee Board, now that the fund has accumulated considerably, announces its intention of awarding this medal annually to a senior student showing outstanding ability in Architectural Design.

Ontario Association of Architects Scholarship

The Ontario Association of Architects offers a scholarship of One Hundred Dollars ($100.00), to the student of the second year in the Department of Architecture who at the annual examinations obtains the highest honour standing in Architectural Design, the scholarship to be awarded annually from 1928 to 1933 inclusive.

The Toronto Brick Company Prizes

The Toronto Brick Company offers two prizes, one of $75.00 and one of $25.00 to those students of the Third Year in the Department of Architecture who win first and second places in a competition arranged by the Staff in the Department of Architecture for this purpose.

Darling and Pearson Prize in Architecture

Messrs. Darling and Pearson, Architects, offer annually a prize of One Hundred Dollars ($100.00) in books to the student in the final year of the Department of Architecture who is assigned the highest marks in a special problem in Architectural Design, set for this purpose by the Department of Architecture. The books constituting this prize are to be selected by the successful candidate, with the approval of the Department of Architecture.

The first award of this prize was made in the Session 1927-28.

The Mathers and Haldenby Prize

Messrs. Mathers and Haldenby, Architects, offer a copy of "Architectural Construction", Vol. I, by Voss and Henry, annually for the next five years, (1928-1932 inclusive), as a prize to the student of the Third Year, Department of Architecture, who is awarded the highest honour standing for the set of measured drawings handed in at the beginning of the session as his Vacation Work.

The Rhodes Scholarship

The trustees of the late Mr. C. J. Rhodes have assigned two of the Rhodes Scholarships to the Province of Ontario.

These scholarships will hereafter be thrown into open competition in the Province, subject to the following conditions:—

1. Candidates must be British subjects, with at least five years' domicile in Canada, and unmarried. They must have passed their nineteenth, but not have passed their twenty-fifth birthday, on October 1st of the year for which they are elected.

2. Candidates must be at least in their Sophomore Year at some recognized degree-granting University or College of Canada, and (if elected) complete the work of that year before coming into residence at Oxford.

3. Candidates may compete either in the Province in which they have received at least two years of their college education, or in the Province in which they have their ordinary private domicile, home or residence.

In each Province there is a Committee of Selection, in whose hands the nominations will rest subject to ratification by the Trustees. The Secretary of the Committee of Selection for Ontario is D. R. Michener, Esq., Barrister, National Building, 372 Bay St., Toronto 2.

The Committees of Selection are instructed to bear in mind the suggestions of Mr. Rhodes, who wished that, in the choice of his Scholars, regard should be had to

(1) Literary and scholastic ability and attainments.

(2) Qualities of manhood, truth, courage, devotion to duty, sympathy, kindliness, unselfishness, and fellowship.

(3) Exhibition of moral force of character and of instincts to lead and to take an interest in his schoolmates.

(4) Physical vigour, as shown by interest in outdoor sports or in other ways.

The ideal Rhodes Scholar should excel in all the qualities indicated, but in the absence of such an ideal combination, Committees will prefer a man who shows distinction either of character and personality, or of intellect, over one who shows a lower degree of excellence in both. Participation and interest in open-air and athletic pursuits form an essential qualification for a Rhodes Scholar, but exceptional athletic distinction is not to be treated as of equal importance with the other requirements. Success in being elected to office in student organizations may or may not be evidence of leadership in the true sense of the word. Mr. Rhodes evidently regarded leadership as consisting in moral courage and in interest in one's fellowmen quite as much as in the more aggressive qualities. In general, candidates will be preferred who will be under the age of 23 when they are due to go into residence at Oxford.

Poverty does not give any special claim to a Scholarship. The strongest candidate will be appointed, irrespective of his financial circumstances.

In the absence of a strong candidate, the Committees will make no appointment.

Every candidate for a Scholarship is required to furnish to the Committee of Selection for his Province the following:—

(*a*) A certificate of age.

(*b*) A photograph preferably unmounted and not larger than 4×7 inches.

(*c*) A written statement from the President or Acting President of his College or University to the effect that his application as a suitable candidate is approved.

(*d*) Certified evidence as to the courses of study pursued by the Scholar at his University, and as to his gradings in those courses. This evidence should be signed by the Registrar, or other responsible official, of his University.

(*e*) A brief statement by himself of his athletic and general activities and interests at College, and of his proposed line of study at Oxford.

(*f*) References to six responsible persons, whose addresses must be given in full, and of whom two at least must be professors under whom he has studied.

The Committee of Selection may summon, except under exceptional circumstances, a candidate to attend a meeting of the Committee of Selection and to write a brief essay.

The next appointments will be made for 1930; applications for these Scholarships with all required material must reach the Secretary of the Committee of Selection not later than November 15, 1929.

Each Scholarship is of the value of £400 a year, and is tenable for three years, subject to the continued approval of the College at Oxford of which the Scholar is a member. The third year is now optional.

The Scholars-elect will come into residence in October of the year for which they are elected.

Students who have obtained the B.A. degree at the University of Toronto, provided that they have resided three years at this University, may apply for "Senior Standing" at Oxford, exempting them from all preliminary and intermediate examinations, and making it possible for them to take their Final Honour Schools, and B.A. degree, in two years.

Students who have resided two years at a Canadian University, and passed the examinations incident to a two years' course which has included two languages other than English, one of which must have been either Latin or Greek, may apply for Junior Standing at Oxford, which carries with it exemption from Responsions, but not from the intermediate examination. They can proceed to their B.A. degree in two years, provided that they obtain Honours either in Moderations or in the Final Honour Schools. Greek is no longer an obligatory subject at Oxford.

It must be realized that £400 will barely meet the expenses of a full year, including vacations. Scholars will probably find it necessary to supplement their Scholarships slightly.

The Rhodes Scholars elected by this University previous to 1919 are as follows:—

1904: E. R. Paterson, University College. (*ob.*)
1906: R. C. Reade, University College.
1908: W. K. Fraser, University College.
1910: A. L. Burt, Victoria College.
1913: C. H. Carruthers, University College.
1915: A. K. Griffin, Trinity College.

The following Rhodes Scholars, students of this University, have been nominated by the Committee of Selection for Ontario and duly appointed by the Rhodes Trust:—

1919: M. D. C. Tait, University College.
1920: J. R. Stirrett, University College.
1921: J. Lowe, Trinity College.
1923: N. J. Endicott, Victoria College.
1924: L. A. MacKay, University College.
1925: D. W. Dow, Faculty of Applied Science and Engineering.
1927: E. M. Reid, Trinity College.
1928: M. St. A. Woodside, University College.
W. L. Smith, Trinity College.
1929: H. R. Ziegler, Faculty of Medicine.
G. S. Cartwright, Trinity College.

THE KHAKI UNIVERSITY AND Y.M.C.A. MEMORIAL SCHOLARSHIP FUND

The Khaki University and Y.M.C.A. Memorial Scholarship Fund was established by the Khaki University Committee. At the present time this fund is being used to make loans to returned-soldier students of the higher years. Applications for such loans should be made to the President of the University.

THE JARDINE MEMORIAL PRIZE FOR ENGLISH VERSE

1. This prize, of the value of $100, is the gift of the late Mrs. T. Herbert Barton in memory of her brother Flight-Lieutenant Gordon Jardine, and is open to any regular undergraduate student who has been in actual attendance at the University during the academic year preceding the date of submission (November 1) or who graduated in the previous academic year.

2. The subject and metre of the poem shall be left to the choice of the competitor.

3. The poems shall be in the hands of the Registrar of the University by November 1st.

4. Each poem shall be signed with a pseudonym and the competitor's name shall be submitted to the Registrar in a sealed envelope on which the pseudonym shall be written.

5. With his or her name the competitor shall enclose a signed statement that the poem is absolutely his or her original work.

6. The competition shall be judged by a board of five examiners, consisting of the head of the Department of English in each of the four colleges, and of a fifth examiner to be chosen by these four.

7. The examiners shall have the power to withhold the award in any year if no poem which has been submitted for that year be found worthy of the prize.

THE UBUKATA FUND

The S. Ubukata Fund of $10,000, the gift of Mr. S. Ubukata, provides for the establishment of prizes, medals, scholarships and loans for which Japanese students of all faculties and colleges may be eligible. Information regarding the conditions of award may be obtained from the Registrar of the University.

THE F. W. JARVIS BURSARIES

Two Bursaries, known as "The F. W. Jarvis Bursaries", of the value of $50 each, the gift of A. H. Jarvis, Esq., of Ottawa, brother of F. W. Jarvis, to be awarded under the following conditions:

1. These Bursaries are open only to former students of Ottawa Collegiate Institute (Lisgar Street), who without some such assistance may not be able to carry on their academic courses.

2. They may be awarded at Matriculation or in any year of an undergraduate course in any Faculty of the University.

3. They shall be awarded preferably one to a man and the other to a woman student; but if in any year students of opposite sexes do not apply, both Bursaries may be awarded to men or to women.

4. A Bursary may be held in successive years by the same student and also in conjunction with any scholarship awarded by the University or the federated colleges.

5. The Bursaries shall be awarded by the Senate of the University on the recommendation of a Committee of Award consisting of the President of the University, the Principal of Ottawa Collegiate Institute and the donor; candidates shall make application for the same not later than May 15th on the special form to be obtained from the Registrar.

THE UNIVERSITY OF TORONTO WAR MEMORIAL SCHOLARSHIPS

Four Scholarships, each of the value of two hundred and fifty dollars have been established by the Alumni Federation of the University from the War Memorial Fund to be awarded to students in the Faculties of Applied Science and Engineering and Forestry.

The general basis on which scholarships may be awarded shall be as follows: (*a*) Standing in course of studies. (*b*) Need of assistance. (*c*)

Merit as shown in extra-academic activities—executive, literary, dramatic, athletic, etc. (*d*) Relationship, if any, to active service during the War.

Information regarding these scholarships may be obtained from the Secretary-Treasurer of the Alumni Federation, Room 225, Simcoe Hall, to whom applications for the same must be made not later than Feb. 15th.

THE McCHARLES PRIZE

This prize was established in connection with the bequest of the late Æneas McCharles of Provincial Government bonds of the value of $10,000, and is awarded on the following terms and conditions, namely, that the interest therefrom shall be given from time to time, but not necessarily every year, like the Nobel prizes in a small way: (1) To any Canadian from one end of the country to the other, and whether student or not, who invents or discovers any new and improved process for the treatment of Canadian ores or minerals of any kind, after such process has been proved to be of special merit on a practical scale; (2) Or for any important discovery, invention or device by any Canadian that will lessen the dangers and loss of life in connection with the use of electricity in supplying power and light; (3) Or for any marked public distinction achieved by any Canadian in scientific research in any useful practical line. The following conditions, as passed by the Board of Governors, determine the method of award:—

(1) The title shall be the McCharles Prize.

(2) The value of the prize shall be One Thousand Dollars ($1,000.00) in money.

(3) The term "Canadian" for the purpose of this award shall mean any person Canadian born who has not renounced British allegiance; and for the purpose of the award in the first of the three cases provided for by the bequest, domicile in Canada shall be an essential condition.

(4) Every candidate for the prize shall be proposed as such in writing by some duly qualified person. A direct application for a prize shall not be considered.

(5) No prize shall be awarded to any discovery or invention unless the same shall have been proved to the satisfaction of the awarding body, to possess the special practical merit indicated by the terms of the bequest.

(6) The order of priority in which the three cases stand in the wording of the bequest shall be observed in making the award; that is, the award shall go *caeteris paribus* to the inventor of methods of smelting Canadian ores; and, failing such inventions, to the inventor of methods for lessening the dangers attendant upon the use of electricity; and only in the third event, if no inventors of sufficient merit in the field of metallurgy and electricity present themselves, to the inventor distinguished in the general field of useful scientific research.

(7) The first award was made in 1910.

(8) The composition of the awarding body shall be as follows:—
An expert in Mineralogy,
An expert in Electricity,
An expert in Physics,
and four other persons. All of the members of this body shall be nominated by the Board of Governors of the University of Toronto.

THE 1851 EXHIBITION SCIENCE RESEARCH SCHOLARSHIP

The Royal Commissioners for the Exhibition of 1851, if satisfied with the qualifications of the candidates put forward, will each year allot three Science Research Scholarships to Canada. The University of Toronto has been invited to recommend annually one or more candidates in order of merit for these Scholarships.

1. Each candidate recommended must be a British subject and under twenty-six years of age, except under very special circumstances; he must be a bona fide student of Science of not less than three years' standing; he must also have completed a full University course and have spent at least one full academic year at this University prior to the date of recommendation.

2. The record of a candidate's work must indicate high promise of capacity for advancing science or its applications by original research. Evidence of this capacity, which is the main qualification for the Scholarship, is strictly required. The most suitable evidence is a satisfactory account by the candidate of research work already performed, and the Commissioners will decline to consider the claims of a candidate unless such an account is furnished, or unless there is other equally distinct evidence that he possesses this qualification.

3. Applications for these Scholarships must be made to the Registrar of the University not later than April 15th; the latest date on which the recommendation of the University of Toronto for Scholarships offered in 1930 can be received at the Office of the Commissioners is June 1st, 1930.

4. Each Scholarship is of the value of £250 per annum, payable quarterly in advance; on presenting to the Commissioners a satisfactory final report at the expiration of his Scholarship the scholar will receive a grant of £25. A scholar who is not in a position to travel at his own expense, or for whom it is not possible to obtain free passage, may make application to the Commissioners for aid towards the payment of his fare from his home to his place of study. A Scholar will receive an additional annual allowance, not exceeding £30, towards the cost of University fees, if, in the opinion of the Commissioners, he is in need of such allowance.

5. The Scholarship will be tenable ordinarily for two years, and in cases of exceptional merit for three years. The continuation of a Scholarship for a second year will depend upon the satisfactory nature of the scholar's first year's work. Renewal for a third year will be granted only where it appears that the renewal is likely to result in work of scientific importance.

6. The scholar will be required to devote himself to research in some branch of pure or applied science, the particular nature of the work proposed to be approved by the Commissioners.

7. A scholarship may be held, with the approval of the Commissioners, at any Institution in the United Kingdom or abroad, but a scholar will not be permitted, except under very special circumstances, to conduct his investigations in the country in which he has received his scientific education.

8. Scholars will be required to furnish reports of their work at the end of each year of tenure of their scholarships.

9. Scholars will be required to devote their whole time to the objects of the scholarship, and will be forbidden to hold any position of emolument which carries with it a duty inconsistent with their obligation to the Commissioners. Scholars must in any case obtain the consent of the Commissioners before accepting any additional emoluments.

10. In case of misconduct on the part of a scholar the Commissioners may, at their absolute discretion, deprive him of his scholarship and all emoluments therefrom.

The regulations adopted by the Senate are as follows:—

The departments, students of which shall be eligible to be candidates. are:—1. Bacteriology; 2. Biochemistry; 3. Botany; 4. Chemistry; 5. Engineering (chemical); 6. Engineering (civil); 7. Engineering (electrical); 8. Engineering (mechanical); 9. Engineering (metallurgical); 10. Engineering (mining); 11. Forestry; 12. Geology; 13. Mineralogy; 14. Physics; 15. Physiology; 16. Zoology.

A student shall not be deemed to be ineligible because of his being on the teaching staff of the University, if he has not been in receipt of a salary of more than $800 per annum and has not been on the teaching staff for more than two years from graduation.

A student shall be deemed to be eligible in the year in which he intends to graduate, but if nominated for the Scholarship his nomination shall be subject to his being successful in passing his examination for his degree.

The nomination of the candidate or candidates shall be made by a Board composed of seven members appointed by the Senate, and the Board shall consist of the Chancellor, the President, the Reverend Dr. Bowles, the Honourable Mr. Justice Masten, the Honourable W. E. Raney, and Dr. C. Morse, and the Board shall have power to call to its aid as assessor any member of the teaching staff.

THE NIPISSING MINING COMPANY RESEARCH FELLOWSHIP

The Nipissing Mining Company has endowed a Research Fellowship in the Department of Mining Engineering to be known as The Nipissing Mining Company Research Fellowship, of the annual value of eleven hundred dollars ($1,100.00).

This Fellowship is open to the graduates of any University.

JUNIOR INSTRUCTORSHIPS

Provision is made for the sessional appointment in various departments of graduates as Fellows or Demonstrators, whose duties shall consist of aiding in the work of instruction under the direction of the department concerned.

Applications for appointment should be made in writing to the Secretary of the Faculty not later than September 1st.

RESEARCH ASSISTANTSHIPS

A number of research assistants in the School of Engineering Research are appointed annually on salary, in the various departments, to carry on the work of research under the direction of members of the staff. This work is accepted as partial fulfilment of the requirements for the degrees of M.A.Sc. and M.Arch. These research assistants are usually recent graduates and are chosen from among those who have displayed special capacity for investigational work in their undergraduate courses. Prospective applicants should consult with members of the staff as soon as possible after the annual examinations.

REGULATIONS RESPECTING EXAMINATIONS

REGULAR EXAMINATIONS

Promotions from one year to another are made on the results of the term work and the annual examinations. A Student proceeding to a degree must pass all the term work and the examinations in the subjects of his course and at the periods arranged from time to time by the Council.

Candidates who fail to pass in any year will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they fail before presenting themselves a second time for examination. (This repetition includes vacation work.)

A student who in either term of the session fails to perform the work of his course in a satisfactory manner may not be allowed to present himself at the final examinations of the year.

No student shall be allowed to pass his Fourth Year unless he has the formal approval of the Head of the Graduating Department in which he is registered, with regard to the laboratory work done under their direction.

Annual examinations will be held at the beginning of the second term on all subjects completed during the first term.

No student will be allowed to write at any examination who has not paid all fees and dues for which he is liable at that time.

The pass marks required on written examinations are 40% and on practical examinations 60%.

Honours will be granted in each department to the students who obtain at least 50 per cent. in each subject, and 75 per cent. of the total number of marks allotted to the department at the annual examinations.

Honour Graduate standing will be granted to those who obtain honours in the final and in one previous year.

TERM EXAMINATIONS

Term examinations may be held in any subject and at any time at the discretion of the instructor or by order of the Council, and the results of such examination may, if the Council so decides, be incorporated with those of the annual examinations in the same subjects.

SUPPLEMENTAL EXAMINATIONS

A candidate who fails in one or two subjects at the Annual Examinations will be required to take supplemental examinations in such subjects.

The supplemental written examinations will begin on the 18th day of September, 1929. Notice in writing of his intention of taking such examinations (including practical ones) must be received from the candidate by the Secretary of the Faculty, and the fee of $10.00 received by the Bursar, not later than the first of September. Council reserves the right to reject applications of, or impose penalties upon, those failing to comply with these requirements. Arrangements will be made to conduct supplemental examinations at the Survey Camp for those students in attendance.

In the case where a candidate desires to write upon an annual examination as a supplemental, his application must be received by the Secretary, and his fee by the Bursar, for the January examinations not later than the first of December and for the April examinations not later than the first of March.

Where a candidate fails to pass a supplemental examination it will be counted as one of the two supplemental examinations which may be allowed him after the next annual examination.

No student will be permitted to take the work required for a laboratory supplemental examination at any time other than the regular time of the session.

OFFICE EXPERIENCE

Department of Architecture

Candidates for the degree of Bachelor of Architecture will be required to submit to Council satisfactory evidence of having worked at least

twelve months in the office of a member of the Ontario Association of Architects before receiving their degrees. Evidence of work in the office of an architect residing outside of the Province may be substituted, providing that he is a member of the local professional organization.

Field Experience

Department of Mining Engineering

The following are the regulations governing field experience certificates:

A candidate for the degree in the Department of Mining Engineering will be required to present satisfactory evidence of having had at least six months' practical experience in work connected with mining, metallurgy or geology, for which he must have received regular wages.

The time may be spent on geological survey, in ore dressing, smelter or lixiviation works, in an assay office in the vicinity of mining or metallurgical works, on any work in or about a mine other than as an office man or clerk, or in prospecting. Not more than three months on geological surveys will be accepted, and prospecting will only count one-half (*i.e.*, four months' prospecting will be counted as two months) and must not be submitted for more than three of the six months.

Certificates must be made out, signed, countersigned and sent during the first term to the Secretary of the Faculty of Applied Science and Engineering, who will retain them.

Shop Work

Departments of Mechanical and Electrical Engineering

Students in Mechanical and in Electrical Engineering are not granted their degree until certificates have been submitted to the Council, and accepted as satisfactory, showing not less than 1,600 hours of mechanical experience in production under commercial conditions. Preferably the work undertaken should be in one of the manufacturing industries or trades with which the course is related. Certificates, on the standard form which may be procured from the Secretary, must be presented on or before the 1st of March of any year.

It is not desirable that a student in these courses should enter the engineering industries without having acquired some experience in mechanical production and it is therefore required that he obtain this experience under commercial conditions, so that he can appreciate shop conditions and limitations.

REGULATIONS RESPECTING TERM WORK

Students working in any laboratory must be governed by the regulations relating thereto as made known from time to time.

No laboratory reports or drawings may be removed from the laboratories without permission. The Council reserves the right to dispose of them as may be thought proper.

No drawings or briefs will be accepted which have not been made in the drafting rooms, and during the hours allotted to such work.

FIELD WORK

Field Work in Surveying of the First and Second Years will be taken on the University grounds, during the first term.

No field notes will be accepted which have not been taken in the field and during the hours allotted to such work.

Students taking practical astronomy are required to take observations in the field for time, latitude and azimuth.

EXCURSIONS TO POINTS OF INTEREST

As a part of Laboratory Instruction excursions to points of technical interest, both in Toronto and elsewhere, are arranged by the staff. These excursions are treated as laboratory periods with the same requirements as to attendance and reports. The total transportation costs in any one year will probably not exceed Ten Dollars.

A limited number of similar excursions may be arranged by the Engineering Society and its constituent Clubs within the Faculty with the approval and co-operation of the department or departments concerned. These excursions being also for instructional purposes are to be treated as laboratory periods.

UNIVERSITY SURVEY CAMP

Students in Departments 1 and 2 will be required to take the Survey Camp between the second and third years, and on failure to do so this work will be taken as a supplemental in the third year. The work will be taken previous to the opening of the fall term, during the months of August and September at the University Survey Camp, situated on the shore of Gull Lake, and about five miles from the Village of Minden (Lot No. 9 in 13th Concession of the Township of Lutterworth). The camp may be reached by taking the train leaving Lindsay for Haliburton, and getting off at Gelert. Conveyances will be on hand to meet students and take them to the camp. Personal effects must be limited to sixty pounds in weight, which must include two pairs of blankets, or their equivalent; beds and mattresses only will be provided.

Students of the Fourth Year in Department 1 who are taking the Astronomy Option are required to spend two weeks at the camp, beginning September 8th, after completing their Third Year.

A field course in Geology is given to students in Department 2 the last week of the session at the camp.

The students of the Second, Third and Fourth Years in the Department of Architecture will be required to attend a course in field sketching at the University Survey Camp during the last week in September.

Students will report at the camp on the dates shown on page 7.

Thesis

In the Fourth Year each student is required to prepare a thesis. The title, form and time for handing in will be determined for each Department as provided in the prescription, 285, page 117. It shall become the property of the University.

The thesis of each student who works upon a research problem in his fourth year must deal with the subject of investigation. In such cases the theses must be handed in not later than one week prior to the close of the annual examinations.

REGULATIONS RESPECTING STUDENTS IN ATTENDANCE

All interference on the part of any student with the personal liberty of another by arresting him, or summoning him to appear before any unauthorized tribunal of students, or otherwise subjecting him to any indignity or personal violence, is forbidden by the Caput.

A student who is under suspension, or who has been expelled from a College or from the University, will not be admitted to the University buildings or grounds.

The name of the University is not to be used in connection with a publication of any kind without the permission of the Caput.

No student will be enrolled in any year, or be allowed to continue in attendance, whose presence is deemed by the Council to be prejudicial to the interests of the University.

Students proceeding regularly to the degree are required to attend the courses of instruction and the examinations in all subjects prescribed for students of their respective standing, and no student will be permitted to remain in the University who persistently neglects academic work.

Unless special permission is granted by the Council, a student who, at the close of two sessions in the University, has failed to secure standing in his year, will not be permitted registration in the Faculty of Applied Science and Engineering.

The constitution of every University society or association of students in the Faculty of Applied Science and Engineering and all amendments to any such constitution must be submitted for approval to the Council of the Faculty. All programmes of such societies or associations must, before publication, receive the sanction of the Council of the Faculty through the Dean. Permission to invite any person not a member of the Staff of the University to preside at or address a meeting of any society or association must be similarly obtained.

The Students' Administrative Council has been entrusted by the Caput with supervision of the conduct of the students, and subject to the approval of the Caput, has power, through the Students' Court or otherwise to deal with violations of the regulations governing conduct.

No initiation ceremony involving physical violence, personal indignity, interference with personal liberty or destruction of property, may be held by the students of any Faculty or College of the University under the penalty of suspension or expulsion.

Students of the Faculty of Applied Science and Engineering, on the premises of Colleges or Faculties other than those in which they are registered, shall be subject to the regulations and penalties imposed by the administrative authorities of the premises concerned.

Any ceremony connected with the reception of the First Year desired by any Faculty or College must be prepared and carried out by a Committee of the Senior Year of the Faculty or College concerned, with the approval of a joint committee of the Caput and the Students' Administrative Council. The holding of such ceremonies except with this approval shall constitute a breach of discipline.

Any student who may be convicted of having taken part in a parade or procession through the city which has not been authorized by the police authorities after application by the Executive of the Students' Administrative Council, will be severely disciplined.

EXEMPTIONS

Applications for exemption from any of the regulations shall be made to the Council in writing and the particulars of the case fully stated.

A student shall submit to Council evidence of illness or other handicap which occurs during the session immediately after its occurrence: no petition for leniency on account of such incidents will be considered if received after the third day following the last day of examinations.

GENERAL INFORMATION FOR STUDENTS

The Council of University College and the governing bodies of the federated universities and colleges, respectively, have disciplinary jurisdiction over and entire responsibility for the conduct of their students in respect of all matters arising or occurring in or upon their respective college buildings and grounds, including residences.

The councils of such of the faculties as have assigned for their separate use any building or buildings and grounds, including residences, have disciplinary jurisdiction over and entire responsibility for the conduct of all students in their respective faculties in respect of all matters arising or occurring in or upon such building, or buildings and grounds.

In all such cases, and, save as aforesaid, as respects all students to whatsoever college or faculty they may belong, disciplinary jurisdiction is vested in the Caput, but the Caput may delegate its authority in any particular case or by any general regulation to the council or other governing body of the university or college or faculty to which the student belongs.

The Caput has also power and authority to determine by general regulations, or otherwise, to what college, faculty or other body the control of university associations belongs.

If there be any questions as to the proper body to exercise jurisdiction in any matter of discipline which may arise, the same shall be determined by the Caput, whose decision shall be final.

Disciplinary jurisdiction includes the power to impose fines.

Information as to the text-books, instruments and materials to be purchased by the students will be given on registration at the beginning of the session.

HART HOUSE

Hart House, the gift of the Massey Foundation, is so called in memory of Mr. Hart Massey. In its widest interpretation it seeks to provide for all the activities in the undergraduate's life apart from the actual work in the lecture room. It affords all the facilities of a first-rate club. In the beauty of its architecture and the various functions which it performs it is unique on this continent.

Hart House contains completely equipped club rooms, including common rooms, reading room, music room, lecture room, sketch room, photographic dark rooms, the Great Hall, which is the students' dining hall, a small Chapel, rooms reserved for religious organizations in the University, gymnasia, squash courts, swimming pool, running track, rifle range, billiard room, library and Hart House Theatre.

Hart House is open from 8.00 a.m. to 11.00 p.m. daily and meals are served in the Great Hall throughout the academic year. Members are entitled to full privileges of all rooms in the building between these hours and the use of the gymnasia, pool, showers and locker rooms until 6.30 p.m. each day, except Sunday, subject to the regulations of the Athletic Association.

The Library contains a good selection of books of general interest. These books must not be taken from the room.

Sunday Evening Concerts are given by the leading musicians of the city at 9 p.m. in the Great Hall on certain Sundays during the session, music recitals take place at 5 p.m. every Friday in the Music Room, and a series of "Songsters" are held in that room on those Sunday evenings when there is not a concert in the Great Hall.

The Sketch Room is equipped with facilities for drawing and painting. Weekly drawing and painting classes are given by a qualified instructor and frequent exhibitions of pictures and lectures on Art are arranged.

Debates on the open parliamentary system are held during the winter in the Lecture Room. Men prominent in the public life of Canada take part from time to time in these debates.

The Headquarters of the Student Christian Association (Men) are in Hart House. There is also a small chapel which is used for informal services.

A group of rooms is set apart for the use of the Faculty Union. A dining room and a common room are also reserved for Graduate Members. Six bed-rooms are available for the use of guests at a reasonable charge.

The Warden is entrusted with the general supervision of the whole House in co-operation with the following committees: House, Hall, Library, Music, Billiard, Sketch, Camera, Squash and Debates. These committees consist of two senior members, a graduate member, the Warden and a full representation of undergraduates. The undergraduates

are elected annually by their fellow students. There is also a Graduates' Committee. The Board of Stewards is the Senior Committee and has final control of the House, being directly responsible to the Board of Governors. It consists of the Warden (ex-officio Chairman) and representatives of the President of the University, the Board of Governors, the Faculty Union, the Athletic Association, the Graduate Members, the Student Christian Association, the Men Students' Administrative Council and the undergraduate secretaries of all Standing Committees. The Comptroller, the Assistant Comptroller, the Secretary, and the Assistant Secretary of Hart House are largely responsible for the administration.

All male undergraduates proceeding to a degree in the University are members of Hart House. The annual fee of $10.00 covers all fees in connection with Hart House and membership in the Athletic Association for the academic year (September to May). Registration cards may be stamped with the Hart House stamp at the Hall Porter's desk on presentation of the Bursar's receipt for fees paid.

Hart House has no endowment whatsoever and is entirely dependent for its upkeep on the fees received from graduates and undergraduates and from various sources of revenue in the House itself.

Other male students in the University, or students in the affiliated or federated institutions receiving instruction in the University, may become members of Hart House on payment of the required fee at the Warden's office.

Graduates resident in Toronto and out-of-town graduates are entitled to the full privileges of Hart House on payment of an annual fee.

HART HOUSE THEATRE

Hart House Theatre is a Repertory Theatre existing to promote the interests of dramatic art in the widest sense. Its performances are open to members of the University and to the general public. The Theatre is operated by a Board of Syndics, who are responsible to the Governors of the University for its administration. It is the policy of the Syndics to permit the use of the Theatre by those dramatic societies within the University which are endeavouring to do serious work.

MEN STUDENTS' ADMINISTRATIVE COUNCIL

The Men Students' Administrative Council has been entrusted by the Caput with supervision of the conduct of the men students, and has power subject to the approval of the Caput to deal with violations of the regulations governing conduct.

Any student who may be convicted of having taken part in a parade or procession through the city which has not been authorized by the police authorities after application by the Executive of the Students' Administrative Council, will be severely disciplined.

The functions of the Council are as follows:

(1) To represent the students on public occasions on matters affecting their interests.

(2) To promote inter-university functions.

(3) To deal with such breaches of discipline on the part of the male student body of the University of Toronto as shall be brought before it.

Members are elected to the Council annually by undergraduates registered in the University of Toronto and its affiliated colleges.

The Council prepares annually a list of approved rooming houses for male students which may be consulted at the opening of the session, in Hart House.

THE JOINT EXECUTIVE, STUDENTS' ADMINISTRATIVE COUNCILS

The Joint Executive Students' Administrative Councils is composed of the Executives of the Men Students' Administrative Council and the Women Students' Administrative Council. The Joint Executive assumes the financial responsibility for the publication of *The Varsity*, *Torontonensis* and the *Students' Handbook*, and also affords a recognized means of communication between the authorities and the Students' Administrative Councils. It represents the students at University functions and on public occasions and receives and administers all funds accruing from Student Council fees, revenues from publications and such other funds as shall become the property of the Executive.

The annual fee for the Students' Administrative Councils paid by all undergraduates proceeding to a degree, provides for a year's subscription to *The Varsity* and entitles the student to a copy of *Torontonensis* on graduation. The fee also covers administration costs of the Joint Executive and Students' Administrative Councils.

UNIVERSITY OF TORONTO ATHLETIC ASSOCIATION

University Athletics for men are under the entire control of the University of Toronto Athletic Association, of which the executive body is the Athletic Directorate. This consists of:

The President of the University,
Two members of the faculty, appointed by the President,
Two graduates, appointed by the Athletic Advisory Board,
The Medical Director and the Financial Secretary (*ex officio*),
Five undergraduates, elected annually,
An undergraduate representative, appointed by the Men Students' Administrative Council.

The Directorate alone has the power to sanction the use of the name "The University of Toronto" in connection with men's athletics, and no athletic event can be held in the University without its approval. It has control of the Athletic Field, the Gymnasium, the Swimming Pool, and other conveniences in connection with Athletics in Hart House, and is empowered by the Board of Governors to make the necessary arrangements to effect the carrying out of the University regulations requiring Physical Training for men.

THE GRADUATING DEPARTMENTS

The instruction in the various departments leading through the four years to the degree of B.A.Sc. and five years to the degree of B.Arch. is designed to give the student a thorough grounding in the fundamentals of the engineering and architectural professions, and in addition a sufficient familiarity with applications of the principles to make him immediately useful upon graduation.

With the exception of Architecture and Chemical Engineering the various courses are very similar in the first year. The succeeding years are devoted to the more particular work of the departments. In the fourth year specialization develops to the extent of various options.

The graduating courses are so designed, with many subjects common to the departments of the several years, that the student upon graduation will find himself sufficiently equipped in the various fundamentals to pursue readily his studies in branches other than the one in which he has graduated and indeed to be useful in them as well. The courses in this Faculty are not planned to make specialists; the process of specialization is more properly deferred until after graduation.

In the teaching of the fundamentals, instruction is not confined wholly to applied science. As the future engineer is vitally concerned with the development of the country, it is essential that he be instructed as well in certain fundamentals in economics, administration and business which, in conjunction with his scientific training, will enable him to develop his full value.

In some departments laboratory work in the fourth year consists of an investigation of some specific problem. In all cases the student's knowledge of the original literature and primary sources of information is extended, and he is given a very desirable and useful training in methods of research. In this way the undergraduate course is linked with the graduate course (see p. 119) and with the work of the School of Engineering Research (see p. 118).

On the following pages the courses of instruction in the different departments are set forth in detail. The time devoted to lectures and practical work is indicated as accurately as possible, but is subject to modification from time to time as occasion may require.

For further information concerning the opportunities available for graduates of this Faculty, reference should be made to the pamphlet issued by the Director of Extension Work and Publicity of the University entitled "Opportunities for Graduates in Applied Science."

1. DEPARTMENT OF CIVIL ENGINEERING

The course in Civil Engineering is designed to meet the needs of the students who intend to take up such work as Geodetic Surveying, Railway Engineering, Municipal Engineering, Sanitary Engineering, Highway Engineering, Structural Engineering, Hydraulic Engineering, and administrative work in connection with both Engineering and Industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Geometrical Optics	185 (*b*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	280	0	2	0	2

Second Year

Subject	No.	Hours per week			
		First Team		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	237	1	1	1	1
Spherical Trigonometry	239	0	0	1	0
Elementary Astronomy	71	1	0	1	0
Descriptive Geometry	162	1	0	1	0
Surveying	272, 273	1	9	1	0
Dynamics	3	1	0	1	0

CIVIL ENGINEERING—SECOND YEAR—Cont.

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Mechanics of Materials......	4	2	0	2	0
Engineering Chemistry......	93	1	0	0	0
Inorganic Chemistry	87A	1	0	0	0
Organic Chemistry..........	95	0	0	1	0
Metallurgy.................	241	0	0	1	0
Geology....................	195	0	0	2	0
Mineralogy.................	257,259	2	1	0	2
Hydrostatics...............	186	0	0	1	1
Heat.......................	187	1	1½	0	0
Photography................	188	1	1½	0	1½
Economics & Finance.......	123	1	0	1	0
Chemical Laboratory........	89	0	0	0	6
Engineering Drawing........	169	0	4½	0	13½
Physical Training..........	280	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Survey Camp............	275	...	...	...	...
Engineering Chemistry....	102	1	0	1	0
Theory of Structures......	6	2	0	2	0
Thermodynamics.........	223, 224	1	0	1	2
Hydraulics...............	205, 206	2	0	2	3
Least Squares............	240	0	0	1	0
Practical Astronomy and Geodesy...............	72, 73	2	2	2	0
Descriptive Geometry.....	164	1	0	0	0
Surveying and Levelling...	274	1	0	1	0
Electricity...............	143, 144(*a*)	1	3	1	0
Stress Graphics...........	10	1	0	1	0
Cements and Concrete....	11	0	0	1	0
Engineering Geology......	197	1	0	1	0
Commercial Law.........	124	1	0	1	0
Public Speaking..........	133	1	0	0	0
Mechanics of Materials Laboratory...........	9	0	3	0	0
Engineering Drawing......	173	0	12	0	15

CIVIL ENGINEERING—FOURTH YEAR

(a) Astronomy Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Survey Camp..........	275	..	..	..	..
Thesis..................	285	0	3	0	0
Engineering Economics..	125	0	0	1	0
Engineering Law........	126	1	0	0	0
Contracts and Specifications................	127	0	0	1	0
Management...........	128	1	0	0	0
Astronomy.............	74, 76	2	23	2	0
Geodesy...............	75, 76	2	0	2	23
Photographic Surveying.	191 (*b*)	1	2	0	0

FOURTH YEAR

(b) Municipal Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis..................	285	0	3	0	0
Engineering Economics..	125	0	0	1	0
Engineering Law........	126	1	0	0	0
Contracts and Specifications................	127	0	0	1	0
Management...........	128	1	0	0	0
Reinforced Concrete.....	15	1	0	1	0
Foundations............	14	1	0	1	0
Hydraulics.............	211	1	3	0	0
Structural Design.......	17	1	0	0	0
Structural Design Drawing..................	179	0	0	0	5
Miscellaneous Structures	19	0	0	1	0
Hygiene and Bacteriology...............	82	1	0	1	6
Biology................	81	0	5	0	0
Sanitary Chemistry.....	117	1	6	0	4
Sanitary Engineering....	267	1	3	1	6
Highway Engineering...	268	1	8	1	8
Municipal Government and Administration...	269	2	2	2	2

CIVIL ENGINEERING—FOURTH YEAR—(c) Structural Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Physical Metallurgy	252	1	0	1	0
Structural Design	17, 18	2	0	1	0
Miscellaneous Structures	19	0	0	1	0
Mechanics of Materials Laboratory	13	0	3	0	6
Structural Design Drawing	178	0	22	0	22

FOURTH YEAR—(d) Hydraulic Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Hydraulics	207, 208, 209	3	10	3	10
Physical Metallurgy	252	1	0	1	0
Structural Design	17, 18	2	0	1	0
Miscellaneous Structures	19	0	0	1	0
Electrical Laboratory	144 (*a*)	0	0	0	3
Mechanics of Materials Laboratory	13	0	6	0	3
Structural Design Drawing	179	0	4	0	8

CIVIL ENGINEERING—FOURTH YEAR

(e) Railway Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	3	0	0
Engineering Economics	125	0	0	1	0
Engineering Law	126	1	0	0	0
Contracts and Specifications	127	0	0	1	0
Management	128	1	0	0	0
Reinforced Concrete	15	1	0	1	0
Foundations	14	1	0	1	0
Theory of Structures	12	2	0	2	0
Hydraulics	211	1	3	0	0
Special Geology	204	0	0	1	1½*
Physical Metallurgy	252	1	0	1	0
Electrical Laboratory	144 *(a)*	0	0	0	3
Motive Power	225	1	0	1	0
Railway and Miscellaneous Structures	20, 19	1	0	1	0
Railway Economics	131	2	0	2	0
Railway Location and Design	276	1	8	1	8
Mechanics of Materials Laboratory	13	0	3	0	6
Structural Design Drawing	179	0	6	0	6

*The ½ hour represents two excursions during the term.

2. DEPARTMENT OF MINING ENGINEERING

The course in Mining Engineering, which originated in 1878 as a course in Assaying and Mining Geology, is intended to serve as a preliminary training for those who expect to practice in some branch of Mining Engineering, such as exploration of mining areas and primary development, mine surveying, mining processes involving civil, mechanical, and electric work of underground workings, mining machinery and operation; milling and treatment of ores, assaying and other forms of analysis and research, and administrative work in connection with both Engineering and Industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
Descriptive Geometry	160	1	0	1	0
Engineering Drawing	166	0	9	0	12
Surveying	270, 271	1	6	1	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Mineralogy	255, 258	2	1	0	3
Technical English	122 (a)	1	0	1	0
Business	121	0	0	1	0
Mining Laboratory	50	0	0	0	3
Physical Training	280	0	2	0	2
Problems and Seminar		0	3	0	3

MINING ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	68	..	..	..	..
Descriptive Geometry	162	1	0	1	0
Engineering Drawing	169	0	3	0	10
Surveying	272, 273	1	6	1	0
Electricity	143	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Theory of Measurements	65	1	0	0	0
Inorganic Chemistry	87A	1	0	0	0
Inorganic Chemistry	87B	0	0	1	0
Chemical Laboratory	89, 90	0	6	0	6
Metallurgy	241	0	0	1	0
Geology	195	0	0	2	0
Dynamic and Structural Geology	198	1	0	0	0
Mineralogy	260, 261	1	2	1	2
Mining	51, 53	1	3	0	0
Steam Engines	216	1	0	0	0
Economics & Finance	123	1	0	1	0
Physical Training	280	0	2	0	2
Problems & Seminar		0	3	0	3

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work	69	..	..	..	..
Survey Camp	275	..	..	..	..
Geological Field Work	193	..	..	..	..
Theory of Structures	7	2	0	0	0
Hydraulics	205, 206	2	0	2	3
Engineering Chemistry	102	1	0	1	0
Analytical Chemistry	88, 99	1	3	1	6
Economic Geology	202, 203	1	0	3	2
Petrography	262, 263	1	2	1	2
Metallurgy	243	1	0	1	0
Mining	54	1	0	1	0

MINING ENGINEERING—THIRD YEAR—Cont.

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Introd. Research.......	66	0	0	0	3
Ore Dressing..........	58, 59	1	3	1	3
Physics of Ore Dressing.	64	1	0	1	0
Assaying..............	45, 46	1	3	0	3
Engineering Drawing...	174	0	9	0	0
Problems & Seminar....		0	3	0	3

FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Vacation Work........	70	..	..	..	..
Thesis................	67	0	7	0	9
Mine Cost Keeping and Management........	56	1	0	1	0
Mining...............	55	1	0	1	0
Ore Dressing..........	60, 61	1	6	1	0
Assaying..............	47, 48	0	0	1	3
Geology, Pleistocene and Physiographic.......	194, 201	1	1	1	0
Geology, Precambrian..	199	2	0	0	0
Geology, Mining.......	200	0	0	2	0
Metallurgy...........	247	1	0	1	6
Thermodynamics......	223, 224	1	3	1	0
Machine Design.......	234	1	0	1	3
Engineering Economics.	125	0	0	1	0
Physical Metallurgy and Metallography.......	244	2	3	0	0
Mechanics of Materials Laboratory.........	9	0	0	0	3
Electrical Laboratory...	144 (b)	0	3	0	0
Problems & Seminar....		0	3	0	3

3. DEPARTMENT OF MECHANICAL ENGINEERING

The course in Mechanical Engineering is intended to serve as a preliminary training for those who intend to take up work connected with the design, manufacture, installation, or operation of machinery for the use of power as generated by steam, gas, oil, and water, and machinery and methods for the production, transportation, and handling of material, heating, ventilation, refrigeration, compressing of air, pumping of water, and all problems of a mechanical nature, and administrative work in connection with both Engineering and Industrial undertakings.

An Aeronautical Engineering Option is established in the Department of Mechanical Engineering embracing the Third and Fourth Years, the prescription of which is given below.

As the Aerodynamic Laboratory accommodation is limited, it may be found necessary to limit the number taking this Option in which case preference will be given to those who have exhibited, during the junior years, marked ability in mathematics, both pure and applied.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Illuminating Engineering	185 (*a*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	280	0	2	0	2

MECHANICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	237	1	1	1	1
Descriptive Geometry	162	1	0	1	0
Dynamics	3(*a*)	1	0	1	0
Mechanics of Materials	4, 9	2	0	2	3
Engineering Chemistry	93	1	0	0	0
Inorganic Chemistry	87A	1	0	0	0
Organic Chemistry	95	0	0	1	0
Metallurgy	241	0	0	1	0
Hydrostatics	186	0	0	1	0
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Steam Engines	216	1	0	1	0
Theory of Mechanism	230	2	1½	2	1½
Compound Stress	10*a*	1	0	0	0
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89	0	0	0	6
Engineering Drawing	170	0	15	0	7½
Physical Training	280	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Theory of Structures	7	2	0	0	0
Thermodynamics	217, 219	2	3	2	3
Hydraulics	205, 206	2	0	2	3
Heat Engines	218	2	0	2	0
Mechanics of Machinery	231	1	0	1	0
Machine Design	233	2	4	2	10
Magnetism & Electricity	138, 140	1	3	1	4½
Alternating Current	139	1	0	1	0
Physical Metallurgy	244	0	0	2	0
Engineering Drawing	177	0	9	0	0

(*a*) Aeronautical Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry..	102	1	0	1	0
Physical Metallurgy....	244	0	0	2	0
Theory of Structures...	7	2	0	0	0
Thermodynamics......	217, 219	2	3	2	3
Heat Engines.........	218	2	0	0	0
Hydraulics............	205, 206	2	0	2	3
Mechanics of Machinery	231	1	0	1	0
Machine Design.......	233	2	3	2	9
Magnetism & Electricity................	138, 140	1	3	1	4½
Alternating Current....	139	1	0	1	0
Advanced Calculus.....	237(*a*)	2	0	2	0
Aeronautics, General...	301	1	0	1	0
Elementary Aerodynamics................	302	0	0	2	0
Engineering Drawing...	177	0	9	0	0

MECHANICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis.................	285	0	1	0	1
Engineering Economics.	125	0	0	1	0
Structural Design.......	17, 18, 180	2	3	0	0
Heat Treatment of Iron and Steel............	253	1	0	1	0
Industrial Management.	130	1	0	1	0
Reinforced Concrete....	21	1	0	0	0
Machine Design........	235	2	7	2	7
Thermodynamics.......	220, 221, 222	3	7	3	8
Hydraulics............	207, 208, 209	3	9	3	6

(*a*) Aeronautical Engineering Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285	0	1	0	1
Engineering Economics	125	0	0	1	0
Industrial Management	130	1	0	1	0
Heat Treatment of Iron, Steel	253	1	0	1	0
Thermodynamics	220, 222	2	6	2	6
Aircraft Structures	22	2	0	2	0
Differential Equations	—	2	1	2	1
Aerodynamics	303	1	0	1	0
Aerodynamic Laboratory	304	0	6	0	6
Aircraft Materials	305	1	0	0	0
Aeroplane Design and Stress Analysis	306	2	8	2	8
Aircraft Propellers	307	1	0	1	0
Aircraft Engines	308	1	0	1	0

THE DEPARTMENT OF ARCHITECTURE

The instruction in the Department of Architecture is arranged mainly to lay a broad foundation for the subsequent professional life of its graduates. A very considerable portion of the course is devoted to architectural design, and a student on graduating should have a thorough knowledge of the broad principles of this important subject, a cultivated taste and an appreciation of the allied arts. In addition, a comprehensive course is given in the various subjects connected with building, and French history, literature and conversation and English literature are taught in the first three years.

Under the new course of five years a student is required to spend twelve months in the offices of recognized architects. This very important practical work is done in the long summer vacations and satisfactory evidence of its completion must be submitted before the granting of a degree. During the period between graduation and the practice of his profession, the student divides his time between the architect's office, where his previous training in drawing and building construction stand him in good stead, and travel abroad, where he finds the taste which he has formed and his knowledge of the history of architectural development and of the French language better equip him for an appreciation of the architecture of the countries which he visits.

Students registered in the Department of Architecture prior to 1928 will continue the course prescribed in the calendar for 1927-1928.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	161	1	0	1	0
Statics	1	2	0	2	0
Building Measurements	37	1	0	1	0
Elements of Architectural Form	28	1	0	1	0
History of Architecture	25	1	3	1	0
Technical English	122 (a)	1	0	1	0
French	264	2	0	2	0
Modelling	36	0	2	0	2
Freehand Drawing	35	0	2	0	2
Architectural Design	31	0	12	0	14
Engineering Drawing	167	0	4	0	4
Physical Training	280	0	2	0	2

ARCHITECTURE—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work	41	..	..	..	..
Descriptive Geometry	163	1	0	1	0
Mechanics of Materials	5	2	0	2	0
Theory of Architectural Planning	32	1	0	1	0
History of Architecture	25 (a)	1	0	1	0
History of Ornament	29	1	0	1	0
Economics & Finance	123	1	0	1	0
English	122 (b)	1	0	1	0
French	264	2	0	2	0
Photography	188	1	1½	0	1½
Modelling	36 (a)	0	2	0	2
Freehand Drawing and Water Color	35 (a)	0	2	0	2
Architectural Design	31 (a)	0	15	0	15
Engineering Drawing	171	0	3	0	3
Physical Training	280	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work	42	..	..	..	..
Structural Design	8	1	3	1	3
History of Architecture	25 (b)	1	0	1	0
Architectural Composition	33	1	0	1	0
Garden Design	27	0	0	1	0
Commercial Law	124	1	0	1	0
French	264	1	0	1	0
Illumination	189	1	3	1	3
Public Speaking	133	1	0	0	0
Modelling	36 (b)	0	2	0	2
Freehand Drawing and Water Color Painting	35 (b)	0	2	0	2
Architectural Design	31 (b)	1	20	0	20

Architecture—Fourth Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Vacation Work........	43	..	..	..	..
Architectural Programmes............	—	1	0	1	0
Garden Design.........	27 (a)	0	0	1	0
Structural Design......	16	1	3	1	3
Acoustics.............	190	1	1½	1	0
History of Fine Art.....	30	1	0	1	0
Building Materials.....	38	2	0	2	0
Modelling from Life....	36 (c)	0	2	0	2
Freehand Drawing from Life................	35 (c)	0	2	0	2
Architectural Design...	31 (c)	1	20	1	20

Fifth Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Studio	Lect.	Studio
Contracts and Specifications...............	127	0	0	1	0
Architectural Aspects of Town Planning......	34	0	0	1	0
Professional Practice....	—	1	0	1	0
Architectural Programmes (Advanced)	—	1	0	1	0
Structural Design......	—	1	3	1	3
Heating and Ventilating	40	1	0	1	0
Sanitary Science.......	39	1	0	1	0
Architectural Design....	31 (d)	2	26	2	26
or					
Architectural Engineering.................		2	28	2	28

6. DEPARTMENT OF CHEMICAL ENGINEERING

The course is designed to give the student a thorough training in Chemistry and its application to industry, as well as a general knowledge of the elements of thermodynamics, hydraulics, machine design, structural design, electricity and metallurgy. A preliminary training of this nature with subsequent practical experience will enable him to undertake the design and construction and also the operation and management of the plant required in such branches of chemical industry as are concerned with the production of chemical and pharmaceutical products, petroleum and its products, rubber goods, leather and glue, soap, meat products, food-stuffs, vegetable and animal oils, sugar, pulp and paper, illuminating gas, coal tar and wood distillates, paints and varnishes, explosives, dyes, glass, portland cement, metals and their alloys, electrochemical products, fermentation products, printers' inks, fertilizers, ceramic and building materials, etc.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Geometrical Optics	185(*b*)	1	3	1	0
Technical English	122(*a*)	1	0	1	0
German	265	2	0	2	0
Business	121	0	0	1	0
Mineralogy Laboratory	256	0	2	0	1
Biological Laboratory	80	0	0	0	3
Chemical Laboratory	86	0	14	0	12
Engineering Drawing	168	0	2	0	3
Physical Training	280	0	2	0	2

Chemical Engineering—Second Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	237	1	1	1	1
Mechanics of Materials	4	2	0	2	0
Engineering Chemistry	93	1	0	0	0
Organic Chemistry	96	2	0	2	0
Metallurgy	241	0	0	1	0
Hydrostatics	186	0	0	1	1
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Industrial Chemistry	94	1	0	1	0
Physical Chemistry	98	2	0	2	0
Inorganic Chemistry	87A	1	0	0	0
Inorganic Chemistry	87B	0	0	1	0
German	265	1	0	1	0
Economics and Finance	123	1	0	1	0
Chemical Laboratory	92, 97	0	10	0	12
Engineering Drawing	172	0	7	0	3
Physical Training	280	0	2	0	2
Industrial Chemistry	94A	0	5	0	5

Third Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Theory of Structures	7	2	0	0	0
Thermodynamics	217, 224	2	0	2	2
Hydraulics	205, 206	2	0	2	1
Metallurgy	243	1	0	1	0
Physical Metallurgy	244	0	0	2	0
Assaying Laboratory	49	0	3	0	0
Analytical Chemistry	88	1	0	1	0
Electrochemistry	107, 108	2	3	0	0
Industrial Chemistry	103	1	0	1	0
Organic Chemistry	105	2	0	2	0
Chemical Plant	104	1	0	1	0
German	265	1	0	1	0
Chemical Laboratory	100, 106	0	7	0	17
Engineering Drawing	177	0	6	0	0
Electrical Laboratory	144 (*c*)	0	0	0	3
Electricity	143	1	0	1	0

CHEMICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285				
Industrial Management	130	1	0	1	0
Machine Design	234	1	0	1	3
German	265	1	0	1	0
or Spanish	266	1	0	1	0
Inorganic Chemistry	109	2	0	2	0
Organic Chemistry	110, 111	1	17	1	0
AND ONE OF:					
Electrochemistry	114, 115	2	*	2	*
Industrial Chemistry	112, 113	1	*	1	*
Sanitary and Forensic Chemistry and Bacteriology	116	1	*	1	*
Metallurgy	247	1	*	1	*
Physical Metallurgy	250	1	*	1	*
Ore Dressing	62, 63	1	0	1	6
Zymology	283	*	*	*	*

*All time not otherwise allotted must be spent in the various laboratories in the proportions assigned by the Department.

7. DEPARTMENT OF ELECTRICAL ENGINEERING

The course in electrical engineering is designed for those who are looking forward to work in connection with the design, manufacture, installation, or operation of electrical machinery and equipment for the generation, transmission, and utilization of power, for domestic and industrial purposes including its many applications to problems of intercommunication in connection with railway, telephone, telegraph, or radio equipment, to work in connection with electrochemical processes, and to administrative work in connection with both engineering and industrial undertakings.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	236	2	0	2	0
Analytical Geometry	238	1	0	2	0
Descriptive Geometry	160	1	0	1	0
Surveying	270, 271	1	6	1	0
Statics	1	2	0	2	0
Dynamics	2	2	0	2	0
General Chemistry	85	2	0	1	0
Electricity	135	2	0	2	0
Illuminating Engineering	185 (*a*)	1	2	1	2
Technical English	122 (*a*)	1	0	1	0
Business	121	0	0	1	0
Engineering Drawing	166	0	11	0	18
Physical Training	280	0	2	0	2

ELECTRICAL ENGINEERING—SECOND YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus	237	1	1	1	1
Descriptive Geometry	162	1	0	1	0
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Engineering Chemistry	93	1	0	0	0
Organic Chemistry	95	0	0	1	0
Inorganic Chemistry	87A	1	0	0	0
Hydrostatics	186	0	0	1	1½
Elementary Machine Design	232	1	0	1	0
Electricity	136, 137	2	3	2	3
Steam Engines	216	1	0	1	0
Theory of Mechanism	230	2	1½	2	1½
Economics and Finance	123	1	0	1	0
Chemical Laboratory	89	0	6	0	0
Engineering Drawing	170	0	12	0	12
Physical Training	280	0	2	0	2

THIRD YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Thermodynamics	217, 219	2	3	2	1
Hydraulics	205, 206	2	0	2	1
Heat Engines	218	1	0	1	0
Mechanics of Machinery	231	1	0	1	0
Machine Design	233	2	4½	2	4½
Alternating Current	139	1	0	2	0
Physical Metallurgy	244	0	0	2	0
Electrochemistry	107, 108	2	3	0	0
Magnetism and Electricity	138	2	0	1	0
Electrical Design	141, 142	1	3	1	3
Commercial Law	124	1	0	1	0
Electrical Laboratory	140	0	6	0	6

ELECTRICAL ENGINEERING—FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis	285				
Engineering Economics	125	0	0	1	0
Industrial Management	130	1	0	1	0
Applied Electricity	145, 146	4	20	4	19
AND ONE OF:					
Hydraulics	207, 208, 209	3	9	3	10
Thermodynamics	220, 221, 222	3	9	3	9
Electrochemistry	114, 115	2	9	2	9
Illumination Design	192	2	9	2	9
Radiotelegraphy	147, 148	2	9	2	9
and					
Acoustics	191(*a*)	1	1	0	0

8. DEPARTMENT OF METALLURGICAL ENGINEERING

This course is designed for those who intend to take up work in connection with the production, treatment and working of metals for the purposes of industry; or the design, construction, or operation of metallurgical plants including smelters, furnaces, foundries, refineries, and lixiviation works; and administrative work in connection with both Engineering and Industrial undertakings.

An optional course in this Department is provided in the Third and Fourth years for those students who wish to become Ceramic Engineers. Ceramic plant experience, approved by the Department, will be necessary before the student will be given his degree. Students who have successfully completed their first and second years in any department of engineering will be allowed to transfer to the Department of Metallurgical Engineering for pursuing this option.

First Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Calculus................	236	2	0	2	0
Analytical Geometry....	238	1	0	2	0
Descriptive Geometry...	160	1	0	1	0
Surveying.............	270, 271	1	6	1	0
Statics.................	1	2	0	2	0
Dynamics..............	2	2	0	2	0
General Chemistry......	85	2	0	1	0
Electricity.............	135	2	0	2	0
Technical English.......	122(*a*)	1	0	1	0
Business...............	121	0	0	1	0
Mineralogy Laboratory..	256	0	2	0	1
Engineering Drawing....	166	0	11	0	18
Physical Training.......	280	0	2	0	2

Metallurgical Engineering—Second Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Dynamics	3	1	0	1	0
Mechanics of Materials	4	2	0	2	0
Chemistry	87A, 87B, 91	1	14	1	13
Metallurgy	241, 242	1	0	2	0
Geology and Ore Deposits	196	1	1	1	1
Steam Engines	216	1	0	0	0
Electricity	136, 137	2	3	2	3
Spanish	266	1	0	1	0
Economics and Finance	123	1	0	1	0
Engineering Drawing	172	0	3	0	6
Physical Training	280	0	2	0	2

Third Year

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry	102	1	0	1	0
Cements and Concrete	11	0	0	1	0
Heat Engines	218	1	0	1	0
Electricity	143, 144 (*d*)	1	3	1	3
Electrochemistry	107, 108	2	3	0	0
Assaying	45, 46	1	3	0	3
Ore Dressing	58, 59	1	3	1	3
Mining	51, 52	1	0	1	0
Metallurgy	245	2	3	1	6
Physical Metallurgy	246	1	3	1	0
Commercial Law	124	1	0	1	0
Chemical Laboratory	101	0	0	0	6
Engineering Drawing	182	0	3	0	0
Analytical Chemistry	88	1	0	1	0
Thermodynamics	223, 224	1	3	1	0

METALLURGICAL ENGINEERING—THIRD YEAR

(a) Ceramic Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Engineering Chemistry.	102	1	0	1	0
Physical Chemistry....	98	2	0	2	0
Engineering Geology....	197	1	0	1	0
Theory of Structures....	7	2	0	0	0
Cements and Concrete..	11	0	0	1	0
Commercial Law.......	124	1	0	1	0
Engineering Drawing...	177	0	6	0	6
Thermodynamics......	223, 224	1	0	1	2
Mineralogy...........	255, 258	2	1	0	0
Petrography...........	260	1	0	1	0
Ceramics (General and Manufacturing)........	254(*a*)	4	0	2	0
Glazes...............	254(*b*)	0	0	2	0
Ceramic Calculations...	254(*c*)	0	0	1	0
Ceramic Laboratory....	254(*d*)	0	6	0	6
Clay Testing..........	254(*e*)	0	6	0	6

FOURTH YEAR

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Thesis................	285	0	6	0	6
Engineering Economics..	125	0	0	1	0
Contracts and Specifications...............	127	0	0	1	0
Plant Management......	129	0	0	1	0
Assaying..............	47, 48	0	0	1	3
Ore Dressing..........	60, 61	1	6	1	0
Electrochemistry........	114, 115	2	3	2	3
Metallurgy.............	249	1	0	1	0
Metallurgy Problems....	248	2	4	2	4
Physical Metallurgy.....	250	1	3	1	3
Hydraulic Laboratory...	210	0	0	0	3
Machine Design.......	234	1	0	1	3

METALLURGICAL ENGINEERING—FOURTH YEAR

(*a*) Ceramic Option

Subject	No.	Hours per week			
		First Term		Second Term	
		Lect.	Lab'y	Lect.	Lab'y
Contracts and Specifications	127	0	0	1	0
Plant Management	129	0	0	1	0
Reinforced Concrete	15	1	0	0	0
Structural Design	18	1	0	0	0
Silicate Chemistry	116(*a*)	2	0	0	0
Pleistocene Geology	194, 201	1	3	1	0
Petrography	262, 263	1	2	1	2
Structural Design Drawing	183	0	6	0	6
Refractories and Ceramic bodies	254(*f*)	2	0	0	0
Glass and enameled iron	254(*g*)	0	0	2	0
Ceramic products and specifications	254(*h*)	0	0	1	0
Ceramic Laboratory	254(*i*)	0	3	0	9
Thesis	285	0	8	0	8
Machine Design	234	1	0	1	3

OUTLINE OF LECTURE AND LABORATORY COURSES PROCEEDING TO BACHELOR DEGREES

On the following pages the courses of instruction are set forth in detail. The time devoted to the various subjects, both for lectures and practical work, is indicated as accurately as possible; the hours, however, shown in the prescriptive schedules on pages 47 to 71 will govern.

The curriculum as printed is intended to cover the prescription for the current year only and does not imply the right of a student to have the course unchanged during any subsequent year of his attendance.

The courses are designed to give the student a sound training in the fundamental scientific principles on which the various branches of engineering are based. The instruction is given by means of lectures and practical work in the laboratories, the drafting rooms and the field.

The courses in the first two years are devoted to the theoretical and essential scientific requirements of the engineering profession as a whole, with an introduction in a few cases of the practical application of these to engineering problems.

In the third and fourth years, the subjects of the former years are continued with particular attention paid to their application to modern engineering practice in the problems of design, erection, installation and operation peculiar to the several branches of the profession.

APPLIED MECHANICS

1. *Statics:*—T. R. Loudon.
   All Departments, I Year; 2 hours per week, both terms.
   This course of lectures deals with forces in a single plane, and concerns chiefly the calculation of tension, compression and shearing stresses in frame structures and solid beams.

2. *Dynamics:*—T. R. Loudon.
   Departments 1, 2, 3, 6, 7, 8, I Year; 2 hours per week; both terms.
   This is an elementary course of lectures on particle dynamics which is extended toward the latter half of the Session to cover the consideration of practical examples of actual bodies in motion.
   Texts:—Tutorial Dynamics—Briggs & Bryan; Analytical Mechanics for Engineers—Seeley and Ensign.

3. *Dynamics of Rotation:*—W. J. Loudon.
   Departments 1, 7, 8, II Year; 1 hour per week; both terms.
   This course covers angular motion, including moments of inertia, simple harmonic motion, the pendulum, centres of mass, suspension and percussion, the simple theory of the fly-wheel and the governor.
   Text Book:—Dynamics of Rotation—Loudon.

3 (*a*) *Dynamics.*—T. R. Loudon.

Department 3; 1 hour per week; both terms.

This course deals chiefly with Dynamics of Rotation. A short course in Hydrodynamics is also given during these lectures.

4. *Mechanics of Materials:*—P. Gillespie.

Departments 1, 2, 3, 6, 7, 8, II Year; 2 hours per week; both terms.

In this course the strength and elasticity of materials are mathematically treated. The stresses in such elements of structures as the tie rod, the beam, the strut and the member subjected to shear are investigated and the elementary principles of design established. In the lecture and drafting rooms through numerous problems involving the design of simple beams, columns, riveted connections, etc., these principles are exemplified. The work includes also the discussion of eccentric loading, suddenly applied loads and repeated stresses.

Reference Book:—Resistance of Materials—Seely.

5. *Mechanics of Materials:*—T. R. Loudon.

Department 4, II Year; 2 hours per week; both terms.

This course deals with the mathematical consideration of stress and elasticity. Among the problems taken up are the consideration of riveted joints, theory of simple and continuous beams, the theory of columns and simple column footings.

Text:—Strength of Materials—Boyd.

6. *Theory of Structures:*—C. R. Young.

Department 1, III Year; 2 hours per week; both terms.

The work of the first term comprises a discussion of moving loads, combined stresses, columns, restrained, continuous and trussed beams, multiple section and box girders, and plate girders. A number of designs of structures and structural details are worked out in the class and drafting rooms.

The second term is given chiefly to the design of a riveted truss highway span and a riveted truss railway span, designs for these structures being made in the lecture and drafting rooms.

Text Books:—Modern Framed Structures, Part III—Johnson, Bryan and Turneaure; Structural Members and Connections—Hool and Kinne; Elementary Structural Problems—Young; A.I.S.C. Handbook, Steel Construction.

7. *Theory of Structures.*—C. F. Morrison.

Departments 2, 3, 3(*a*), 6 and 8(*a*), III Year; 2 hours per week; first term.

The work is practically the same as that for Course 6 in the first term.

8. *Structural Design.*—T. R. Loudon, W. J. T. Wright.

Department 4, III Year; 1 hour per week lecture, 3 hours per week studio; both terms.

During the first term, the economics of the design of floor systems in timber and structural steel are discussed. The design of masonry piers, structural steel and timber columns is also gone into in the first term.

The second term is taken up in the discussion of the design of roof trusses and an introduction to reinforced concrete.

9. *Mechanics of Materials:*—P. Gillespie.

Department 3, II Year; Department 1, III Year; Department 2, IV Year; 3 hours per week; one term.

This laboratory course is intended to give the student an introduction to the experimental study of the strength and elasticity of materials. It is intended that he shall acquire some familiarity with the construction and operation of testing machines and with the properties of ordinary materials of construction.

Reference:—Junior Laboratory Course in Mechanics of Materials, Department of Civil Engineering, Municipal and Structural.

10. *Stress Graphics:*—T. R. Loudon.

Department 1, III Year; one hour per week; both terms.

This course of lectures deals mainly with graphic methods of solving stresses in framed structures. The construction of Shearing Force diagrams, Bending Moment diagrams and Influence Lines is also dealt with.

Text Book:—Graphic Analysis—Wolfe.

10(*a*). *Compound Stress:*—T. R. Loudon.

Department 3, II Year; one hour per week, first term.

This course deals mainly with the discussion of methods determining the stress conditions in bodies subjected to compound stress. Both analytical and graphical methods of analysis are discussed.

11. *Cements and Concrete:*—P. Gillespie.

Departments, 1, 8, and 8 (a) III Year; one hour per week; second term.

The manufacture, testing and use of Portland cement and the fundamentals of the theory of reinforced concrete are discussed in this course of lectures.

Reference Book:—Reinforced Concrete Construction, Vol. I, Hool.

12. *Theory of Structures:*—C. R. Young.

Departments 1(c), (d), (e), and 3(a), IV Year; 2 hours per week; both terms.

The work comprised in this course of lectures concerns arches, suspension bridges, cantilever bridges, swing bridges, deflections, and secondary stresses. Problems based on the lectures are worked out in the drafting rooms.

Reference Books:—Modern Framed Structures, Part II—Johnson, Bryan and Turneaure; Theory of Structures—Spofford.

13. *Mechanics of Materials:*—P. Gillespie.

Departments 1 (c), (d) and (e), IV Year; a laboratory course of 3 hours per week one term and 6 hours per week the other term.

This course of experiments is intended to give the student practice in investigating the elastic and physical properties of iron, steel, concrete, timber, etc., and in the use of instruments of precision designed for that purpose.

Reference Book:—Materials of Construction—Johnson.

14. *Foundations, Retaining Walls and Dams:*—P. Gillespie, W. J. Smither.

Department 1 (b), (c), (d) and (e), IV Year; 1 hour per week; both terms.

This course of lectures is devoted to the design of the structures mentioned. Preparatory to the discussion of the practical aspects of the subjects, and in order to gain familiarity with the fundamental principles involved, a part of the first term is given over to the consideration of the theory of compound stress. The most approved forms of construction of retaining walls, footings, abutments, piers and dams are then described, and typical designs are worked out in the class and drafting rooms.

Some attention is also given to the principles of formula charting.

Text Books and Books of Reference:—Retaining Walls for Earth—M. A. Howe; Walls, Bins and Grain Elevators—M. S. Ketchum; Design and Construction of Dams—E. Wegmann.

15. *Reinforced Concrete:*—P. Gillespie.

Department 1 (b), (c), (d) and (e); IV Year, 1 hour per week, both terms; and Department 8 (a), IV Year; 1 hour per week; first term.

The theory of the strength of reinforced concrete elements including the beam, the slab, the T-beam, the column and the footing, is continued in this course.

The analysis of the monolithic arch by the elastic theory is discussed, and the student is required in the drafting room to apply his knowledge to the design of simple structures.

Reference books:—Principles of Reinforced Concrete Construction—Turneaure and Maurer; Reinforced Concrete Construction, Vol. I—Hool.

16. *Structural Design:*—T. R. Loudon.

Department 4, IV Year; 1 hour lecture and 3 hours laboratory per week; both terms.

During this course of lectures, the economics of the design of buildings in reinforced concrete and steel are discussed. This course of lectures is supplemented by the actual designing of buildings in the drafting room.

Text:—Principles of Reinforced Concrete—Turneaure and Maurer.

17. *Structural Design:*—C. R. Young, W. J. Smither.

Department 1_c, 1_d, IV Year; 1 hour per week; both terms.

Department 1_b and 3, IV Year; 1 hour per week; first term.

This course of lectures is devoted to the problems connected with the structural design of buildings of timber, steel and reinforced concrete. The various structural elements such as the floors, columns, footings, walls and wind bracing, are fully discussed, and portions of typical buildings are designed in the class and drafting rooms.

Text Books:—Handbook of Building Construction—Hool and Johnson; Architects' and Builders' Handbook—Kidder-Nolan.

18. *Structural Design:*—C. R. Young, W. J. Smither.

Departments 1_c, 1_d, 3 and 8 (a), IV Year; 1 hour per week; first term.

Consideration is given in this course to the various types of mill buildings, to the conditions governing their choice and to the details of construction in different materials. Designs of portions of mill buildings are worked out in the class and drafting rooms.

Text Books:—Steel Mill Buildings—Ketchum. Mill Buildings—Tyrrell.

19. *Miscellaneous Structures:*—W. J. Smither.

Department 1 (b), (c), (d) and (e), IV Year; 1 hour per week; second term.

In this course of lectures the application of theoretical principles to the design of a variety of structures is made. Among those structures discussed are transmission line towers, elevated tanks and their supporting towers, standpipes, large pressure pipes, sewers, culverts, small highway bridges, sub-surface tanks and tall chimneys. Whenever possible the lecture work is followed up by designs in the drafting room.

20. *Railway Structures:*—C. R. Young.

Department 1_e, IV Year; 1 hour per week; first term.

A course of lectures with exercises covering alternative bridge layouts with comparative estimates of costs, temporary and permanent trestles, tunnels, tunnels vs. bridges, buildings, turntables, snow sheds and shelters.

21. *Reinforced Concrete.*—P. Gillespie.
Department 3, IV Year, 1 hour per week; first term.
In this course the elements of the theory of Reinforced Concrete are studied. Applications of this theory to the design of columns, beams and floors are made.
Reference Book:—Reinforced Concrete Construction, Vol. I—Hool.

22. *Aircraft Structures.*—C. F. Morrison.
Dept. 3 (a), IV Year; 2 hrs. per week; both terms.
Determination of the stresses in the different members of aircraft structures. The method of least work and the generalized theorem of three moments.
Reference Books:—Aeroplane Structures—Pippard and Pritchard.
Airplane Structures—Niles.

ARCHITECTURE

25. *History of Architecture:*—H. H. Madill, E. R. Arthur.
I Year; 1 hour per week; both terms.
In this course the development of architecture is traced from Prehistoric times to the Early Romanesque.

25*a*. *History of Architecture:*—H. H. Madill, E. R. Arthur.
II Year; 1 hour per week; both terms.
In this course the development of architecture is traced from the Romanesque Period to the present time.

25*b*. *History of Architecture:*—H. H. Madill, E. R. Arthur.
III Year; 1 hour per week; both terms.
In this course the work of the Renaissance in Italy, France and England is taken in greater detail than was possible in the broad field covered in the previous year.

26. *Advanced Architectural Programmes:*—H. H. Madill, E. R. Arthur.
IV Year; 1 hour per week; both terms.
In this course of lectures the principles underlying the planning of such large buildings as Churches, Departmental Stores, Theatres, Schools, Railway Stations, etc., are discussed in detail.

27. *Garden Design:*—H. B. Dunington-Grubb.
III Year.
In this course the historical development of Garden Design is traced from earliest times; the study of sites; the influence of topography, orientation, access, etc., on the problems of design; site planning; the location of buildings; the solution of an actual problem on a typical site.

27*a*. *Garden Design:*—H. B. Dunington-Grubb.
IV Year.
The work of the previous year is continued and a problem is set in the studio involving principles of both architectural and garden design.

28. *Elements of Architectural Form:*—E. R. Arthur.

I Year; 1 hour per week; both terms.

Lectures on the Five Orders of Architecture, their affiliated forms and other elements used in design. This course is preliminary to the lectures given in the II Year on the Theory of Architectural Planning.

29. *Architectural Ornament:*—H. H. Madill.

II Year; 1 hour per week; both terms.

In this course the development of Ornament is traced from the beginning through Egyptian, Assyrian, Grecian, Roman, Byzantine, Romanesque, Gothic and Renaissance styles. An attempt is made to analyze ornament of the best periods and to systematize the principles followed in form and colour.

30. *History of Fine Art:*—C. W. Jefferys, F. Coates.

IV Year; 1 hour per week; both terms.

The course consists of an outline of the history and development of painting and of the minor pictorial arts from the earliest time until the present day; followed by an outline of the history and development of the different eras of sculpture ranging from the primitive to the present day.

31. *Architectural Design:*—H. H. Madill, E. R. Arthur.

I Year.

This comprises work done in the Studio, including lettering, the drawing and rendering of the Orders and such elementary motives as a door, a window, etc.

This is followed by a drawing in which the Classic orders and ornament taken from a particular building are arranged in the form of a composition, and by an elementary problem in design.

31*a*. *Architectural Design:*—H. H. Madill, E. R. Arthur.

II Year.

This course is given by means of individual instruction in the studio and by criticisms of the solutions of different problems set during the year. It is in this course that the student begins the serious study of design; continued practice in architectural drawing and rendering affords the training necessary to make of the student a proficient draughtsman.

31*b*. *Architectural Design:*—H. H. Madill, E. R. Arthur.

III Year.

This course is given by individual instruction in the studio and by criticisms of solutions of problems set during the year. The greater part of the course is devoted to problems in design and forms a continuation of the course given in the preceding year.

31*c*. *Architectural Design:*—H. H. Madill, E. R. Arthur.
IV Year.
This course is a continuation of the work of the preceding years, being given by individual instruction in the studio and criticisms of the solution of problems set during the year.
During the second term architectural working drawings of a building designed by the student are prepared in the studio.

31*d*. *Architectural Design:*—T. R. Loudon, H. H. Madill, E. R. Arthur.
V Year; Architectural Engineering Option.
Department 4, V Year; Architectural Engineering Option.
In this course the design and preparation of working drawings and structural details of work of a monumental character is carried on in the studio.

32. *Theory of Architectural Planning:*—E. R. Arthur.
II Year.
In this course special attention is given to the elements and general principles of architectural planning.

33. *Architectural Composition:*—E. R. Arthur.
III Year.
This course consists of a series of lectures on the theory of architectural design, the analysis of composition, proportion, scale, etc.

34. *Architectural Aspects of Town Planning:*—E. R. Arthur.
V Year; 1 hour per week; second term.
In this course of lectures the Historical Development of Town Planning is traced with particular reference to the Axial Planning of the Renaissance, Public Squares, the Grouping of Buildings and the placing of Monuments.

35. *Freehand Drawing and Water Colour Painting:*—C. W. Jefferys.
I Year; 3 hours per week; both terms.
Drawing from still life objects. Primary free hand perspective. Primary pencil, charcoal, and pen and ink rendering.

35*a*. II Year; 3 hours per week; both terms.
Drawing and monochrome painting from still life.
Drawing from the cast.
Pencil, pen and ink, and monochrome rendering.
Primary water colour.
Drawing from landscape and natural objects.

35*b*. III Year; 3 hours per week; both terms.
Drawing from the cast.
Water colour from still life. Water colour rendering.
Drawing from landscape and natural objects.
Students who are sufficiently advanced are admitted to the Fourth Year Life Drawing Class.

35*c*. IV Year; 3 hours per week; both terms.
Water colour from still life and from landscape.
Drawing from life.
Water colour rendering.

36. *Modelling:*—Frederick Coates.
I Year; 2 hours per week; both terms.
The Orders. Synopsis of styles.

36*a*. II Year; 2 hours per week; both terms.
Problems in figures and in relation to architecture.

36*b*. III Year; 2 hours per week; both terms.
Styles continued.
Problems, combination of figure, ornament and architecture and their relative values.

36*c*. IV Year; 2 hours per week; both terms.
Modelling from life.
Anatomy.
Composition of groups.

37. *Building Measurement:*—C. H. C. Wright.
I Year; 1 hour per week; both terms.
In this course of lectures the principles of measurements and mensuration with special reference to buildings will be discussed. With this is combined practice in measurements of existing buildings, quantities, etc.

38. *Building Materials:*—C. H. C. Wright.
IV Year; 2 hours per week; both terms.
The structural and aesthetic value of the various building materials.

39. *Sanitary Science:*—H. H. Madill.
V Year; 1 hour per week; both terms.
Modern plumbing, its design and installation, drainage, sewerage disposal and water supply.

40. *Heating and Ventilating:*—C. H. C. Wright.
V Year; 1 hour per week; both terms.
The design of different systems, where they should be used, heating specifications, etc.

41. *Vacation Work:*—H. H. Madill.
II Year.
Each student will be required to submit a set of twenty pages of notes on building construction on or before the opening day of the session. These notes are to consist of freehand pencil drawings with figured dimensions. Instruction as to the nature of these notes will be given by Professor H. H. Madill before the close of the previous session.

42. *Vacation Work:*—E. R. Arthur.

III Year.

Each student is required to submit on or before the opening day of the session a set of rendered measured drawings of existing buildings or portions of buildings, the building first to be approved by Prof. Arthur, who will also decide the number and size of the drawings to be made. The record of measurements must be preserved in a notebook which will be submitted with the final drawings.

43. *Vacation Work.*—C. H. C. Wright, C. W. Jefferys.

IV Year.

Each student is required to submit on or before the opening day of the session a set of at least six outdoor sketches in water colour, pen and ink, or pencil. The minimum size for each sheet will be $9'' \times 12''$. Of these sketches at least two will be in water colour and three will be of an architectural character.

ASSAYING, MINING AND ORE DRESSING

The work in Mining is directed more to the development of the proper attitude of mind towards mining problems than to the teaching of actual mining methods.

The teaching of Assaying has a two-fold function. The first is to give the student a working knowledge of the practice of the art, so that he can earn money as an assayer on graduation and use this as a stepping-stone to other positions. The second is to use the assaying laboratories for the training of the students in certain important phases of Engineering methods. The size of the apparatus, the completeness of the processes in short intervals of time, the extreme accuracy of results when so desired, the relation of the extent of error to time and method, the similarity of the academic laboratory to the field laboratory, all these permit an unrivalled opportunity for driving home much broad Engineering philosophy. The assaying processes and apparatus lend themselves peculiarly well for the development of a proper perspective in regard to errors and accuracy in measurements.

The study of Ore Dressing, when accompanied by laboratory work in a well equipped ore dressing laboratory, is one of the most important of the Mining Engineering subjects. Not only is the mechanical treatment of ores a very important branch of Mining Engineering, but the mental processes involved in a study of the fundamental principles underlying the art and the compromise necessary for field practice form one of the best fields for the development of Engineering philosophy. From these points of view the ore dressing laboratory is exceptionally well equipped.

45. *Assaying:*—J. T. King.
Departments 2 and 8, III Year; 1 hour per week; first term.
A first course of lectures on the theory of fire assaying. Emphasis is laid not only on the chemical and metallurgical principles involved, but upon the errors inherent in operators as well as in methods.
Text Book:—Manual of Fire Assaying—Fulton.

46. *Assaying:*—J. T. King.
Departments 2 and 8, III Year; 3 hours per week; both terms.
A laboratory course in the determination of the precious metals in ores, milling and metallurgical products. Scorification and crucible assays of ores and products, pure and impure, fluxes, slags and solutions. Buckboard practice, ores with metallics. Copper and lead by electrolysis. Students are expected to do their later assays with despatch and a reasonable degree of accuracy. Neatness of work is required.

47. *Assaying:*—J. T. King.
Departments 2 and 8, IV Year; 1 hour lecture per week; second term.
A continuation of course 45. Complex ores. Combination assays. The sampling and assay of bullion. The Platinum group metals. Checks and corrections.

48. *Assaying:*—J. T. King.
Departments 2 and 8, IV Year; 3 hours per week; second term.
An advanced laboratory course in which some of the methods of course 47 are used.

49. *Assaying:*—J. T. King.
Department 6, III Year; 3 hours per week; first term.
An introductory laboratory course for Chemical Engineers. Some lecture instruction is given. An abbreviation of courses 45 and 46.

50. *Mining:*—H. E. T. Haultain, F. C. Dyer.
Department 2, I Year; 3 hours per week; second term.
A laboratory course, including some lectures, being an introduction to certain mining and milling machinery and methods.

51. *Mining:*—H. E. T. Haultain.
Department 2, II Year and Department 8, III Year; 1 hour per week; first term.
An introductory course of lectures.

52. *Mining:*—H. E. T. Haultain.
Department 8, III Year; 1 hour per week; second term.
An extension of No. 51.

53. *Mining:*—F. C. Dyer.
Department 2, II Year; 3 hours per week; first term.
Continuation of No. 50. Rock drills, sampling methods, use of explosives.

54. *Mining:*—H. E. T. Haultain, F. C. Dyer.
Department 2, III Year; 1 hour per week; both terms.
Principles of mining.

55. *Mining:*—H. E. T. Haultain.
Department 2, IV Year; 1 hour per week; both terms.
Special problems, estimates, reports.

56. *Mine Cost Keeping and Management:*—H. E. T. Haultain.
Department 2, IV Year; 1 hour per week; both terms.
One of the fundamental features that must not be lost sight of by the Mining Engineer is, that his work is designed primarily for purposes of financial profit. This course of lectures deals with details from this point of view. The total cost of a ton of ore requiring as it does an understanding of the problems of amortization, is first dealt with in a broad way. Then are considered various problems of cost keeping, leading on to problems of time and motion study which are essential to the development of the fine points of the art in any particular mining problem. The latter part of the course deals with problems of management, the relations of members of the staff to each other, and the relations of the staff to labour.

58. *Ore Dressing:*—H. E. T. Haultain, F. C. Dyer.
Departments 2 and 8, III Year; 1 hour per week; both terms.
The general principles of Ore dressing.

59. *Ore Dressing:*—F. C. Dyer.
Departments 2 and 8, III Year; 3 hours per week; both terms.
Work with crushing machinery, principles of crushing and grading, screen analyses, concentration with gravity separation apparatus, etc.

60. *Ore Dressing:*—H. E. T. Haultain, F. C. Dyer.
Departments 2 and 8, IV Year; 1 hour per week; both terms.
No. 58 continued, study of flow sheets and special problems.

61. *Ore Dressing:*—F. C. Dyer.
Departments 2 and 8, IV Year; 6 continuous hours per week; first term.
Advanced work with ore dressing appliances, ore testing and check mill runs.

62. *Ore Dressing:*—F. C. Dyer.
Department 6*k*, IV Year; 1 hour per week; both terms.
General principles of ore dressing.

63. *Ore Dressing:*—F. C. Dyer.
Department 6*k*, IV Year; 1 period of 6 hours per week; second term.
Principles of sampling, crushing and grading, screen analyses, concentration with gravity separation apparatus, flotation, ore testing, etc.

64. *Physics of Ore Dressing.*—F. C. Dyer.

Department 2, III Year; 1 hour per week; both terms.

Ore dressing methods involve a study of the laws governing the phenomena of surface tension, capillarity and colloidal solutions, in addition to those of hydrostatics and certain phases of hydraulics. This is embodied in a special course of lectures in conjunction with laboratory work in the Ore dressing laboratory.

65. *Theory of Measurement.*—H. E. T. Haultain, F. C. Dyer.

Department 2, II Year; 1 hour per week; first term.

This title is not an entirely suitable one for this course of lectures because it is generally applied to a study of the philosophy of extremely accurate measurements. The Mining Engineer has to continually make satisfactory use of measurements with a wide range of inaccuracy. This course of lectures deals with the philosophy underlying the causes of these errors and the practical application of such approximations. The opportunity is taken in these lectures to deal with the subject of illustrating measurements by graphs.

66. *Introductory Research:*—H. E. T. Haultain, F. C. Dyer.

Department 2, III Year; 3 hours per week; second term.

This is a laboratory course including some lectures and is a preparation for the thesis of the fourth year.

67. *Thesis.*

Department 2, IV Year; 7 hours per week; first term; 10 hours per week, second term, in continuous periods.

Thesis in this department consists mainly in reports on original work done in the laboratories. In the III year the subject "Introductory Research" paves the way for the thesis. By October 15th the student decides on the subject of his thesis in consultation with his professors. After this is decided the student uses his own initiative in the development of his work.

The thesis is divided into three parts. The first part, which is handed in during the first week in November, contains the title, a statement of what the title is meant to convey and an outline of the work that is proposed to be done. The second part is handed in during the first week of January and contains a report of progress to date and enables the professor in charge to keep in closer touch with the work. The third and final part is handed in a week before the examinations and is a report of progress to date with final conclusions. The three parts combined constitute the thesis.

68. *Vacation Work.*—H. E. T. Haultain, W. A. Parks.
Department 2, II Year.
Construction notes are required. Special instructions will be issued concerning these.

69. *Vacation Work:*—H. E. T. Haultain.
Department 2, III Year.
This is a series of letters written during the summer vacation, dealing with various aspects of a mining engineer's work. These are intended to direct and help the student's powers of observation, analysis and criticism as well as being exercises in the art of lucid technical expression.
Special instructions will be issued in connection with these letters.

70. *Vacation Work:*—H. E. T. Haultain.
Department 2, IV Year.
Special instructions will be given in connection with this work.

ASTRONOMY AND GEODESY

71. *Astronomy, Elementary:*—R. K. Young.
Department 1, II Year; 1 hour per week, both terms.
A course in descriptive Astronomy, explaining the ordinary astronomical terms, and describing the various celestial bodies and their motions. In the evenings opportunity will be given for identifying the stars and for observing with telescopes.
Text book:—Fath, Elements of Astronomy.

72. *Astronomy and Geodesy:*—L. B. Stewart.
Department 1, III Year; 2 hours per week; both terms.
The course of lectures deals with the determination of time, latitude, longitude and azimuth, by methods adapted to the use of the surveyor's transit and the sextant. It is designed to fulfil the requirements of the final examinaticns for Ontario and Dominion Land Surveyors.

In Geodesy an account is given of the principles and methods of a secondary triangulation survey, also of the principles involved in the North-West system of survey.
Text books:—Practical Astronomy as applied to Geodesy and Navigation—Doolittle, Notes on Practical Astronomy and Geodesy, Nautical Almanac, 1930.

73. *Field Work:*—L. B. Stewart, S. R. Crerar.
Department 1, III Year; about 2 hours per week, first term.
The practical work in this subject comprises observations in the field with the transit and sextant for the determination of time, latitude and azimuth by the methods described in the lectures.

74. ***Astronomy (Advanced):*—L. B. Stewart.**

Department 1a, IV Year; 2 hours per week; both terms.

The lecture course in this subject comprises the theory and adjustment of the instruments used in connection with a geodetic survey; the methods of taking and reducing observations for time, longitude, latitude, and azimuth, with the precision required on such a survey; and other matters relating to these subjects.

75. ***Geodesy and Metrology:*—L. B. Stewart.**

Department 1a, IV Year; 2 hours per week; both terms.

The lecture course includes a description of the methods of measuring base lines and the angles of a triangulation; the geometry of the spheroid with applications to geodetic problems; the computation of geodetic positions; the solution of large triangles on the earth's surface, and the adjustment of a triangulation; trigonometric and precise spirit levelling; the determination of the figure of the earth by arc measurements, and by the pendulum; the theory of map projections, etc.

76. ***Astronomy, Geodesy and Metrology:*—L. B. Stewart.**

Department 1a, IV Year; about 23 hours per week; both terms.

The practical work in the above subjects includes the observation of meridian transits for time and longitude determinations, and of prime vertical transits for latitude, with the astronomical transit instrument; the observation of meridian zenith distances of stars, and of azimuths at elongation for latitude, with the alt-azimuth; theodolite observations for azimuth; observations for latitude with the zenith telescope; the investigation of the constants of the instruments used, and the reduction of all observations; the measurement of a base line with the steel tape and with invar wires, and the determination of the constants of the tape; the measurement of the angles of a triangulation and the adjustment of the angles of network of triangles, etc. A portion of this work will be taken at the Summer Survey Camp. (See page 38.)

BIOLOGY

80. *Elementary Biology;*—G. H. Duff.

Department 6, I Year; 6 hours per week, first term.

An elementary laboratory course on the nature and identification of plant and animal tissues and products, with microscope practice.

81. *Elementary Biology:*—J. W. MacArthur.

Department 1b, IV Year.

A special course of Lectures, Laboratory work and demonstrations, dealing particularly with organisms of fresh water and sewage;

their identification, classification, distribution, life histories, sanitary importance and control.

Text book:—Whipple –Microscopy of Drinking Water, 4th ed. (1927).

82. *Hygiene and Bacteriology:*—D. T. Fraser and R. R. McClenahan.

Department 1_b, IV Year.

(1) This is a course of twenty-five lectures, dealing with the principles of Hygiene and Sanitary Science and including a discussion of the facts in Bacteriology which are necessary for a proper understanding of Hygiene and Sanitary Science. The particular phases of the subject which are of importance from the standpoint of Sanitary Engineering are dealt with.

(2) This is a laboratory course of six hours per week, second term, dealing especially with the Bacteriology of water, milk and sewage.

CHEMISTRY

85. *General Chemistry:*—E. G. R. Ardagh.

Departments 1, 2, 3, 6, 7, 8, I Year; 2 hours per week, first term; 1 hour per week, second term.

A lecture course in general chemistry, with experimental illustrations.

86. *Inorganic Chemistry:*—L. J. Rogers.

Department 6, I Year; 12 hours per week, both terms.

A laboratory course of quantitative experiments illustrating the use of the sensitive balance, and confirming the fundamental laws of chemistry; qualitative inorganic analysis; quantitative analysis of pure salts.

Text books:—Analytical Chemistry, Vol. II—Treadwell-Hall; Qualitative Chemical Analysis—A. A. Noyes.

87A. *Inorganic Chemistry A:*—E. G. R. Ardagh.

Departments 1, 2, 3, 6, 7 and 8, II Year; 1 hour per week, first term.

A continuation of Course 85 dealing especially with the metals.

87B. *Inorganic Chemistry B:*—E. G. R. Ardagh.

Departments 2, 6 and 8, II Year; 1 hour per week, second term.

A lecture course on theoretical chemistry with special reference to the metals; a continuation of Course 85.

Text book:— Smith's College Chemistry—Kendall.

88. *Analytical Chemistry:*—L. J. Rogers.

Departments 2, 6 and 8, III Year; 1 hour per week, both terms.

A lecture course on the principles of chemical analysis; select gravimetric and volumetric methods; technical analysis.

90. *Analytical Chemistry.*—J. W. Bain, E. A. Smith.
Departments 1, 2 and 3, II Year; 6 hours per week, second term; Dept. 7, II Year; 6 hours per week, first term.
Laboratory course in qualitative and quantitative analysis.

90. *Analytical Chemistry:*—J. W. Bain, E. A. Smith.
Department 2, II Year; 6 hours per week, one term.
A laboratory course in the gravimetric determination of metals and acids, with elementary volumetric analysis.

91. *Analytical Chemistry:*—L. J. Rogers.
Department 8, II Year; about 14 hours per week, first term; about 13 hours per week, second term.
A laboratory course comprising gravimetric and volumetric methods, acidimetry and alkalimetry.
Text books:—Analytical Chemistry, Vol. II—Treadwell-Hall; Qualitative Chemical Analysis—A. A. Noyes.

92. *Analytical Chemistry:*—L. J. Rogers.
Department 6, II Year; 120 hours; first term.
A laboratory course in quantitative chemical analysis; inorganic preparations.
Text book:—Analytical Chemistry, Vol. II—Treadwell-Hall.

93. *Engineering Chemistry:*—J. W. Bain.
Departments 1, 3, 6 and 7, II Year; 1 hour per week, first term.
A lecture course consisting of a study of the industrial production and application of heat, and of the chemistry of fuel and the products of combustion.

94. *Industrial Chemistry:*—J. W. Bain.
Department 6, II Year; 1 hour per week, both terms.
A lecture course on the manufacture of salts, acids, alkalies and inorganic chemicals.

94*a*. *Industrial Chemistry.*—E. G. R. Ardagh.
Department 6, II Year; 60 hours; second term.
An introductory laboratory course in industrial chemistry.

95. *Organic Chemistry:*—M. C. Boswell.
Departments 1, 3 and 7, II Year; 1 hour per week, second term.
A lecture course in elementary organic chemistry.

96. *Organic Chemistry:*—M. C. Boswell.
Department 6, II Year; 2 hours per week, both terms.
A lecture course dealing with the aliphatic compounds.

97. *Organic Chemistry:*—M. C. Boswell, E. A. Smith.
Department 6, II Year; 100 hours, second term.
A laboratory course in organic preparations.

98. *Physical Chemistry:*—F. B. Kenrick.
Departments 6, II Year and Department 8 (a), III Year; 2 hours per week, both terms.

A course of lectures on the elements of chemical mechanics, and the theory of solutions.

99. *Analytical Chemistry:*—L. J. Rogers.
Department 2, III Year; 9 hours per week, second term.
A laboratory course on the technical analysis of ores and furnace products.

100. *Industrial Chemistry:*—E. G. R. Ardagh.
Department 6, III Year; 175 hours.
A laboratory course in industrial chemistry

101. *Analytical Chemistry and Phase Rule:*—L. J. Rogers, J. T. Burt-Gerrans.
Department 8, III Year; about 6 hours per week, second term.
A laboratory course in analysis and phase rule.

102. *Engineering Chemistry:*—J. W. Bain, E. G. R. Ardagh.
Departments 1, 2, 3, 3(a), 6, 7, 8 and 8(a), III Year; 1 hour per week, both terms.
A lecture course on the application of chemistry to engineering problems; air, water, the materials of construction, explosives, etc.

103. *Industrial Chemistry:*—E. G. R. Ardagh.
Department 6, III Year; 1 hour per week, both terms.
A lecture course on petroleum and its products, coal tar and its products; fats, oils, soap, sugar, starch, gums, rubber; fermentation industries, etc.

104. *Chemical Plant:*—J. W. Bain.
Department 6, III Year; 1 hour per week, both terms.
A lecture course on the machinery and plant used in chemical manufacturing.

105. *Organic Chemistry:*—M. C. Boswell.
Department 6, III Year; 2 hours per week, both terms.
A lecture course on the aromatic series.

106. *Organic Chemistry.*—M. C. Boswell, E. A. Smith.
Department 6, III Year; 125 hours.
A laboratory course in organic preparations in the aromatic series.

107. *Electrochemistry:*—W. L. Miller.
Departments 6, 7 and 8, III Year; 2 hours per week, first term.
A lecture course on elementary electrochemistry, illustrated by experiments.

108. *Electrochemistry:*—W. L. Miller, J. T. Burt-Gerrans.
Departments 6, 7 and 8, III Year; 3 hours per week, first term.
A laboratory course in quantitative measurements to accompany Course 107.

109. *Inorganic Chemistry:*—J. W. Bain.
Department 6, IV Year; 2 hours per week, both terms.
A lecture course on chemical theory.

110. *Organic Chemistry:*—M. C. Boswell.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on advanced organic chemistry.

111. *Organic Chemistry.*—M. C. Boswell, E. A. Smith.
Department 6, IV Year.
A laboratory course in advanced organic chemistry; about seventeen hours first term.

112. *Industrial Chemistry:*—J. W. Bain.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on selected subjects in chemical technology.

113. *Industrial Chemistry:*—J. W. Bain, E. G. R. Ardagh, M. C. Boswell.
Department 6, IV Year.
A laboratory course in industrial problems.

114. *Electrochemistry:*—J. T. Burt-Gerrans.
Department 6h, 7h, and 8, IV Year; 2 hours per week, both terms.
An advanced lecture course on the theory of solutions and electrolysis, and the application to the practice of electro-deposition and electrolytic refining of metals. The course also includes lectures on the electric furnace with special consideration of efficiency.
Reference books:—Electrometallurgy—Borchers; Electrochemistry—Le Blanc; Electrochemistry—Luepke; Principles of Applied Electrochemistry—Allmand and Ellingham; The Electric Furnace—Stanfield; The Electric Furnace—Pring.

115. *Electrochemistry:*—W. L. Miller, J. T. Burt-Gerrans.
Departments 6h, 7h and 8, IV Year.
A laboratory course accompanying Course 114.

116. *Sanitary and Forensic Chemistry:*—J. W. Bain.
Department 6, IV Year; 1 hour per week, both terms.
A lecture course on the composition and examination of air, water and food; poisons and their detection, with accompanying laboratory course.

116. (*a*) *Silicate Chemistry:*—J. B. Ferguson.
Department 8(a), IV Year; 2 hours per week, first term. The application of phase rule to the chemistry of refractory materials.

117. *Sanitary Chemistry:*—E. G. R. Ardagh.
Department 1_b, IV Year; 1 hour lecture and 6 hours laboratory, first term; 4 hours laboratory, second term.
A lecture and laboratory course on water supply, sewage disposal, ventilation, etc.

ECONOMICS AND BUSINESS ADMINISTRATION

121. *Business.*—R. R. Grant.

Departments 1, 2, 3, 6, 7, 8, I Year; 1 hour per week, second term.

A lecture course on the principles underlying accounting and general business methods of a simple nature in order to enable the student to understand simple financial reports.

122. *Technical English:*—W. J. T. Wright.

(*a*) All Departments, I Year; 1 hour per week, both terms.

A lecture course on the expression of ideas and the compilation and writing of different types of engineering reports; technical exposition; the derivation and use of technical terms; the necessity of accurate expression in professional writing; terminology; the use of graphic methods for presenting facts; abbreviations; numbers; symbols.

(*b*) Department 4, II Year; 1 hour per week, both terms.

This course of lectures includes a discourse on the literature which refers either directly or indirectly to architecture and the arts. Books are reviewed and discussed in round-table talks and essays prepared for practice in expression. The preparation of specifications and contracts for the execution of construction is continued from the course in the first year, specializing in architectural types.

123. *Economics and Finance.*—C. R. Fay, C. H. Mitchell.

All Departments, II Year; 1 hour per week, both terms.

An introduction to the study of Economics. The course will deal in an elementary fashion with the following:

(1) Scope and Method of Economics.
(2) Theory of Value and Distribution.
(3) Structure of Industry and Social Conditions.
(4) Money, Banking and Public Finance.
(5) Economics of Canada with special reference to the relation of Engineering to Finance.

Text Book:—Economics for the General Reader—Clay.

124. *Commercial Law:*—A. R. Clute.

Departments 1, 4, 7, 8, III Year; 1 hour per week, both terms.

General Principles of the Law of Contracts, Principal and Agent, Partnership and Limited Companies (with special reference to the Companies Acts). General view of the following:—Negotiable Instruments, Sale of Goods, Bills of Sale and Chattel Mortgages, Suretyship and Guarantee.

Text-Book:—Stephens' Elements of Mercantile Law (6th Edition.)

125. *Engineering Economics:*—C. R. Young.

Departments 1, 2, 3, 3(a), 7 and 8, IV Year; 1 hour per week, second term.

A series of lectures on the principles by which the economic practicability of a project is judged and the comparison of competing proposals is made. Consideration is given to first cost and annual cost, methods of estimating, fixed charges and operating expenses, valuation and appraisals. Special attention is given to depreciation and the methods of providing for it, as well as to its relation to amortization. Typical numerical problems are discussed and solved.

Text Books:—Engineering Economies—Fish; Financial Engineering —Goldman.

126. *Engineering Law:*—R. E. Laidlaw.

Department 1, IV Year; 1 hour per week, first term.

A course of lectures, co-ordinating Engineering practice and Law as contained in various legislation such as: The Railway Act, Municipal Act, Public Health Act, Arbitration Act, Workmen's Compensation Act, Patents, Copyrights, etc.

127. *Contracts and Specifications:*—C. R. Young.

Departments 1, 8, and 8 (a) IV Year; Department 4, V Year; 1 hour per week, second term.

This course of lectures deals with the fundamental principles of contract and specification writing. The critical examination of typical specifications and agreements by the class, forms an essential feature of the instruction.

Text Book: Elements of Specification Writing—Kirby.

128. *Management:*—C. R. Young.

Department 1, IV Year; 1 hour per week, first term.

A series of lectures dealing with the fundamental principles upon which management is based. The possibilities of effective management are indicated and its basis is shown to exist in suitable organization, adequate equipment and smooth administration. Consideration is given to such matters as selection of personnel, essentials of effective organization for enterprises of widely different character and the art of directing a force so as to attain a desired end in an expeditious and effective manner.

Text Books:—Construction Cost Keeping and Management—Gillette and Dana; Principles of Industrial Organization—Kimball; Administration of Industrial Enterprises—Jones.

129. *Plant Management:*—G. A. Guess.

Department 8 and 8 (a), IV Year; 1 hour per week, second term.

A course of twelve lectures dealing with some phases of labour, plant organization, smelter contracts and markets.

130. *Industrial Management:*—E. A. Allcut.

Departments 3, 3(a), 6 and 7, IV Year; 1 lecture per week, both terms.

This course includes a study of industrial organization, location, arrangement, construction and equipment of industrial plants for efficiency and economy, process routing, scheduling work, reports, methods of superintending, employment, systems of compensating labour and systems of distributing indirect expenses.

131. *Railway Economics:*—W. M. Treadgold.

Department 1, (e), IV Year; 2 hours per week, both terms.

The object of this course is to make the student acquainted with the general principle of railroad engineering and the following branches of the subject will be discussed—economic theory of location, train resistance, effect of grade, distance and curvature, rise and fall, maintenance of way, yards and terminals, tunnels and street railway practice.

133. *Public Speaking:*—W. H. Greaves.

Department 1 and 4, III Year; 1 hour per week, first term.

A course on the principles of public speaking and the means of expression accompanied by practical application and training in actual speaking.

ELECTRICITY

135. *Electricity:*—H. W. Price.

Departments 1, 2, 3, 6, 7 and 8, I Year; 2 hours per week, both terms.

A course of lectures on basic principles relating to electric circuits, magnetic circuits, instruments and apparatus in general, distribution of electrical energy, etc., illustrated largely from commercial apparatus. The point of view of this work is quantitative rather than descriptive, for it is believed that men who can solve engineering problems are most likely to grasp underlying principles.

136. *Electricity:*—W. S. Guest.

Departments 3, 6, 7 and 8, II Year; 2 hours per week, both terms.

Deals with the theory of electrical measurements, and detailed study of various methods applicable under different conditions in engineering practice to the measurement of resistance, current, potential difference, inductance and capacity, power and energy; calibration of commercial measuring instruments. The effect of choice of conditions and measurement on the accuracy of the result is considered.

137. *Electrical Laboratory:*—W. S. Guest.

Departments 3, 6, 7 and 8, II Year; 3 hours per week, both terms.

This laboratory course is closely associated with the lecture course 136 on electricity for the second year. The more important and useful methods of measurement for electromotive force, resistance, current, grounds, etc., are practised, often under conditions such as occur in practice. The work also includes methods of calibration of measuring instruments for voltage, current, power and energy. Inductance and capacity are also measured.

138. *Magnetism and Electricity:*—A. R. Zimmer.

Departments 3 and 3(a), III Year; 1 hour per week, both terms.

Department 7, III Year; 2 hours per week, first term; 1 hour per week, second term.

A course of lectures on theory of magnetism and magnetic circuits, theory of direct-current generators, motors, etc.

139. *Alternating Current:*—A. R. Zimmer.

Departments 3 and 3(a), III Year; 1 hour per week, both terms.

Department 7, III Year; 1 hour per week, first term; 2 hours per week, second term.

A first course of lectures on alternating current, covering principles of measurement and leading to the analytical and graphical treatment of the simpler problems relative to alternating-current circuits and machinery.

140. *Electrical Laboratory:*—A. R. Zimmer.

Departments 3 and 3(a), III Year; 3 hours per week first term, 4½ hours per week second term; Department 7, III Year; 6 hours per week, both terms.

This laboratory course is intended to afford the student an opportunity to become familiar with principles involved in continuous-current shunt, series and compound-wound generators and motors, and, to some extent, alternating-current circuits and machinery. Other sections of the work deal with the magnetic properties of iron and steel, and study of iron losses in transformers and generators.

The course is arranged to stand in close relation to the lecture courses in the subjects of magnetism and electricity and alternating current (138, 139) for III Year, and to certain design work (141).

141. *Electrical Design:*—H. W. Price.

Department 7, III Year; 1 hour per week, both terms.

A course of lectures dealing with design of electrical apparatus and machinery, accompanied by designs to be worked out in the design room.

142. *Electrical Design:*—H. W. Price.

Department 7, III Year; 3 hours per week, both terms.

A design room is set apart for working out designs of electrical apparatus such as transformers, generators, motors, auxiliary apparatus, etc.

Special forms and notes are employed, arranged to suit the various studies. Certain models are provided to assist where necessary.

143. *Electricity:*—H. W. Price.

Departments 1, 2, 6 and 8, III Year; Department 2, II Year; 1 hour per week, both terms.

A course dealing with fundamental calculations of alternating current circuits and various applications of interest to those who are not making electricity a major subject.

144. *Electrical Laboratory:*—H. W. Price, A. R. Zimmer.

(*a*) Department 1.
III Year; 3 hours per week, first term.
IV Year; Options *d* and *e*, 3 hours per week, second term.

(*b*) Department 2.
IV Year; 3 hours per week, first term.

(*d*) Department 6.
III Year; 3 hours per week, second term.

(*e*) Department 8.
III Year; 3 hours per week, both terms.

These courses are arranged to suit the requirements of the departments concerned. The experiments are planned with the idea of affording a general knowledge of circuits, power measurements, direct-current and alternating-current machinery and transmission of power.

145. *Applied Electricity:*—(*a*) Symbolic and Graphical Methods,
(*b*) Wave Form and Transmission Line—T. R. Rosebrugh.

Department 7, IV Year; 2 hours per week.

(*a*) Complex quantities and their use in a.c. problems. Loci for current and voltage vectors for given limitations on circuit constants. Short line distribution circuit loci; approximate graphical theory of synchronous motor.

(*b*) Non-sinusoidal alternating current waves, analysis of waves, forms of symmetry, three phase limitations, elimination of undesired harmonics, heating of rotary converters; power, current, and voltage readings as influenced by wave form.

Long distance transmission line; principles and calculation. Unequal lines in tandem and in parallel.

Applied Electricity, (*c*) A.C. Machinery and Measurements:—H. W. Price.

Department 7, IV Year; 2 hours per week.

Polyphase alternating-current measurements of power, reactive power, apparent power, finding the indications of meters from given wiring diagrams, constructing wiring diagrams to obtain required meter indications. Potential and current transformers. Meter indications with distorted wave forms. Power transformers. Properties of alternators; induction motors of squirrel cage and wound-rotor types; synchronous motors; regulators; current-limiting reactors; arresters; and other general apparatus.

146. *Electrical Laboratory:*—A. R. Zimmer.

Department 7, IV Year, in connection with 145; 20 hours per week.

This laboratory course involves a thorough study of principles and properties of single and polyphase circuits and apparatus. Both vector and analytical methods are applied to the solution of problems based on tests made on laboratory machines.

The work deals mainly with constant-voltage and constant-current transformers, single and polyphase alternators, synchronous motors, rotary converters, induction and single phase commutating motors, transmission line, etc. The work does not consist only of factory tests, but is designed to lead the student to apply theory to practice as illustrated in the apparatus under test, with a view to an exact understanding of methods and an appreciation of limitations under many conditions. Free use is made of the oscillograph as a necessary device for "seeing" conditions under investigation. The best commercial measuring instruments are available.

147. *Radiotelegraphy:*—T. R. Rosebrugh.

Department 7. Option *r*, IV Year, in connection with 148; 2 hours per week.

Natural oscillations of simple and simply coupled circuits. Action of C.W. on circuits of the most general character. Radiation of antennas. Theory of modulation in radiotelephony. Energy control and transformation by vacuum tubes.

148. *Radiotelegraph Laboratory.*—B. de F. Bayly.

Department 7. Option *r*, IV Year, in connection with 147; 9 hours per week.

The work in this laboratory covers the principles and the technique of measurements at radio frequencies. This includes measurements of wave length, resonance, coupled circuits, inductance, capacity, energy distribution, resistance, etc., at radio frequencies.

Considerable work is also done with the three electrode vacuum tube and its uses in radio and audio-frequency circuits.

ENGINEERING DRAWING AND DESCRIPTIVE GEOMETRY

160. *Descriptive Geometry:*—J. R. Cockburn.
Departments 1, 2, 3, 6, 7 and 8, I Year; 1 hour per week; both terms.
This course of lectures deals chiefly with the principles of orthographic and oblique projections and the application of such principles to the solutions of problems relating to straight lines and planes.

161. *Descriptive Geometry:*—J. R. Cockburn.
Department 4, I Year; 1 hour per week; both terms.
This course of lectures deals chiefly with the principles of orthographic and oblique projections and the application of such principles to the solution of problems relating to straight lines and planes, special reference being made to the determination of shades and shadows.

162. *Descriptive Geometry:*—J. R. Cockburn.
Departments 1, 2, 3 and 7, II Year; 1 hour per week, both terms.
This course of lectures is a continuation of the work taken in the first year with the following additions: Problems relating to curved surfaces, principles of shades, shadows and perspective.

163. *Descriptive Geometry:*—J. R. Cockburn.
Department 4, II Year; 1 hour per week; both terms.
This course of lectures is a continuation of the work taken in the First Year with the addition of problems relating to curved surfaces, shades, shadows and perspective.

164. *Descriptive Geometry:*—J. R. Cockburn.
Department 1, III Year; 1 hour per week, first term.
This course of lectures deals with spherical projections, the principles of mapmaking, and the graphical solution of spherical triangles.

166. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Departments 1, 3, 7 and 8, I Year; 11 hours per week, first term; 18 hours per week, second term; Department 2, I Year, 9 hours per week, first term, 12 hours per week, second term.
Copying from the flat, lettering, topography; graphical solution of problems in statics; problems in descriptive geometry, relating to both orthographic and oblique projections; the plotting of original surveys; measured drawings.

167. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Department 4, I Year.
Lettering, the graphical solution of problems in statics; problems in descriptive geometry, relating to both orthographic and oblique projections; measured drawings.

168. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Department 6, I Year; 8 hours per week, first term.
Copying from the flat, lettering, graphical solution of problems in statics, problems in descriptive geometry.

169. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Departments 1 and 2, II Year. Department 1, 4½ hours per week, first term; 13½ hours per week, second term. Department 2, 3 hours per week first term; 10 hours per week, second term.
Colouring and shading as applied to both topographical and construction drawings; problems in descriptive geometry relating to solids bounded by curved surfaces; principles of shades, shadows and perspective; solution of problems in optics and strength of materials; measured drawings; elementary design.

170. *Engineering Drawing;*—J. R. Cockburn, W. J. T. Wright.
Departments 3 and 7, II Year; Department 3, 15 hours per week, first term; 7½ hours per week second term; Department 7, 12 hours per week, both terms.
Colouring and shading as applied to construction drawings; problems in descriptive geometry relating to solids bounded by curved surfaces; principles of shades, shadows and perspective; solution of problems in optics, theory of mechanism and strength of materials; measured drawings; elementary design.

171. *Engineering Drawing:*—J. R. Cockburn.
Department 4, II Year.
Principles of shades, shadows and perspective; problems in descriptive geometry relating to solids bound by curved surfaces; solution of problems in strength of materials.

172. *Engineering Drawing:*—J. R. Cockburn, W. J. T. Wright.
Department 6, II Years; 7 hours per week, first term; 3 hours per week, second term.
Department 8, II Year; 3 hours per week, first term; 6 hours per week, second term.
(Same as Department 3 with the exception that Dept. 6 has no descriptive geometry.)

173. *Engineering Drawing:*—W. B. Dunbar.
Department 1, III Year; 12 hours per week first term; 15 hours per week, second term.
Principles of mapmaking, spherical projection; problems in theory of construction; original design of various structures.

174. *Engineering Drawing:*—W. B. Dunbar.
Department 2, III Year; 9 hours per week, first term.
Problems in theory of construction; original design.

177. *Engineering Drawing:*—W. B. Dunbar.
Departments 3, 3(a), 6 and 8 (a), III Year; Department 3, 9 hours per week; first term; Department 6, 6 hours per week; first term; Department 8 (a), 6 hours per week; first term; 3 hours per week; second term.
Problems in design dealing with the theory of structures.

178. *Structural Design Drawing:*—W. J. Smither.
Department 1 (c), IV Year; 22 hours per week, both terms.
Problems in structural design.

179. *Structural Design Drawing:*—W. J. Smither.
Department 1*b*, IV Year; 5 hours per week, second term.
Department 1*d*, IV Year; 4 hours per week, first term; 8 hours per week, second term.
Department 1*e*, IV Year; 6 hours per week, both terms.
Problems in structural design.

180. *Structural Design Drawing:*—W. J. Smither.
Department 3, IV Year; 3 hours per week, first term.
Problems in mill building design.

181. *Structural Design Drawing:*—W. J. Smither.
Department 3, IV Year, Option (b); 3 hours per week, first term.
Problems in reinforced concrete design.

182. *Engineering Drawing:*—W. B. Dunbar.
Department 8, III Year; 3 hours per week, first term.
Plotting metallurgical flow sheets.

183. *Structural Design Drawing:*—J. Roy Cockburn.
Department 8 (a), IV Year; 6 hours per week, both terms.
Original design of ceramic plants, driers, kilns, etc.

ENGINEERING PHYSICS

185. (*a*) *Illuminating Engineering:*—G. R. Anderson.
Departments 3 and 7, I Year.
A course on the production and distribution of artificial light. Photometry and illumination calculations. Principles of interior lighting.
Lectures and laboratory work, both terms.

185. (*b*) *Geometrical Optics:*—G. R. Anderson.
Departments 1 and 6, I Year.
Nature of light, reflection, refraction, and dispersion. Theory of optical instruments. Polarization of light and its applications.
Lectures and laboratory work, both terms.

186. *Hydrostatics:*—G. R. Anderson.
Departments 1, 6, 7, II Year; Department 3, II Year, lectures only.
Laws of fluid pressure and application to machines. Density of solids, and fluids. Theory of flotation.
Lectures and laboratory work, second term.

187. ***Heat:*—G. R. Anderson.**

Department 1, II Year.

Generation and propagation of heat. General and industrial thermometry, calorimetry and pyrometry. Linear and cubical expansion, gas laws. Specific heat of solids, liquids and gases, latent heat of fusion and vaporization. Mechanical equivalent of heat. Carnot cycle.

Lecture and laboratory work. Fall term.

188. *Photography:*—K. B. Jackson.

Departments 1 and 4, II Year.

The camera and its adjustments, lenses, shutters, screens. Plates for various purposes, films, prevention of halation. Lighting, exposure, development. Paper of various kinds, printing, enlargement and reduction, blue printing and allied processes. Record photography, photogrammetry and photo-surveying. Photography in colour.

Lectures Fall term, and laboratory work both terms.

189. *Illumination:*—G. R. Anderson.

Department 4, II Year.

A special course on interior illumination, and the design of lighting installations for private and public buildings.

190. *Acoustics:*—G. R. Anderson.

Department 4, IV Year.

Elementary acoustics, including production of sound by vibrating bodies. Special attention to the acoustics of buildings including the properties and uses of deadening material and calculations of reverberation.

191. (*a*) *Acoustics:*—G. R. Anderson.

Department 7r, IV Year.

Wave motion, Fourier's theorem, laws of vibrating systems, musical scales. Reflection and refraction of sound waves.

Combined lecture and laboratory course, first term only.

191. (*b*) *Photographic Surveying:*—G. R. Anderson.

Department 1a, IV Year; 1 hour lecture and 2 hours laboratory, first term.

This course presupposes a general knowledge of photographic processes as given in the second year. Treatment of a photograph as a perspective drawing from which plan and elevation to scale may be obtained under certain conditions. The intersection method of photographic surveying, its advantages and limitations. The stereoscopic method with its advantages and disadvantages. Method of plotting. Accuracy of results.

192. *Illumination Design:*—G. R. Anderson.

Department 7i, IV Year.

The design, installation and maintenance of artificial lighting for commercial and industrial operations. Street lighting. Economics of illumination.

GEOLOGY

193. *Field Work:*—E. S. Moore.

Department 2, III Year; one week preceding the opening of the first term.

194. *Pleistocene Geology and Physiography:*—A. MacLean.

Departments 2 and 8 (a), IV Year; 1 hour per week, both terms.

Pleistocene Geology.—Lectures on the formation and distribution of the drift deposits of North America, with brief references to other regions. Glacial, Interglacial, and Postglacial beds are described, changes of climate are discussed with their probable causes, and the economic features of the clays, sands, and gravels are pointed out.

Physiography.—A course of lectures on the surface forms of the earth, with the geological factors which have produced them. The broad features of the earth, its plains, tablelands, hills, valleys, mountains, oceans, rivers, and lakes are discussed in a general way; methods of topographical surveying and mapping are referred to, and the chief physiographic areas of Canada are described.

Works of Reference:—Ice Ages, Recent and Ancient—Coleman; Physiography—Salisbury.

195. *Elementary Geology:*—W. A. Parks.

Departments 1, 2, II Year; 2 hours per week, second term.

This course deals chiefly with historical geology with special reference to Canadian formations.

Works of Reference:—Introduction to Geology—Scott; Elementary Geology—Coleman and Parks.

196. *Geology and Ore Deposits:*—A. MacLean.

Department 8, II Year; 2 hours per week, both terms.

Lectures and laboratory work on historical, structural, and economic geology, designed to familiarize the student with the more important principles, facts, and terms of general geology.

Works of Reference:—As in Course 195.

197. *Engineering Geology:*—A. MacLean.

Department 1 and 8 (a), III Year; 1 hour per week, both terms.

This course deals with the application to engineering of dynamic, structural, and economic geology.

Works of Reference:—Engineering Geology—Ries and Watson.

198. *Dynamic and Structural Geology:*—A. MacLean.
Department 2, II Year; 1 hour per week, first term.
Lectures on geological forces and their effects. Particular attention is given to those aspects of the subject which apply in mining.

199. *Precambrian Geology:*—E. S. Moore.
Department 2, IV Year; 2 hours per week, first term.
Lectures on the Precambrian formations of Canada—their rocks, distribution, relationships, and economic features. Briefer accounts are given of similar formations in the United States and elsewhere.
Works of Reference:—Reports of the Geological Survey of Canada and of the Ontario Department of Mines; Reports of the United States Geological Survey.

200. *Mining Geology:*—E. S. Moore.
Department 2, IV Year; 2 hours per week, second term.
A course of lectures on geological problems associated with mining, typical mining regions in Canada, the United States, and elsewhere being discussed from the geological side.
Works of Reference:—Mineral Industry; Geology Applied to Mining—Spurr; and the works mentioned under Course 199.

201. *Geological Excursions:*—The Staff in Geology.
Departments 2 and 8 (a), IV Year.
During October and November weekly trips will be made to points of interest near Toronto.

202. *Economic Geology:*—E. S. Moore.
Department 2, III Year.
(*a*) *Ore Deposits:* 1 hour per week, both terms.
Discussion of the origin and classification of ore deposits, the mode of occurrence of the chief ores, and statistics of production. Special attention is given to the metals mined in Canada.
(*b*) *Economic Geology of the Non-metals:* 2 hours per week, second term.
Lectures on the origin and mode of occurrence of the valuable non-metallic substances—coal, oil, building stone, gypsum, cement materials, etc.
Works of Reference:—Economic Geology—Ries; General Economic Geology—Emmons; Ore Magmas—Spurr; Coal—Moore; Practical Oil Geology—Hager.

203. *Economic Geology:*—E. S. Moore.
Department 2, III Year; 2 hours per week, second term.
Laboratory work on ores, manner of occurrence, vein structure, etc., also the examination and construction of geological maps and sections of typical mining regions.

204. *Special Geology:*—A. MacLean.

Department 1 (e), IV Year; 1 hour lecture and 1½ hour laboratory work per week, second term.

A lecture and laboratory course on superficial geology, physiographic control, water geology, etc.

Works of Reference:—Political and Commercial Geology—J. E. Spurr.

HYDRAULICS

205. *Hydraulics:*—R. W. Angus.

Departments 1, 2, 3, 3a, 6 and 7, III Year; 2 hours per week, both terms.

This is a course of lectures in hydraulics devoted to the development and discussion of formulae relating to the flow of water in pipes, the measurement of discharge by various methods, such as orifices and weirs, the conditions of flow obtaining in open channels, artificial and natural, and in pipes flowing partially full, together with other kindred subjects.

The object of this course is to provide the student with a good working knowledge of the fundamental principle of hydraulics, such as is useful in practical work, and is necessary to the intelligent investigation of more advanced problems, such as the design of water supply, sewerage and irrigation system, and water power plants.

206. *Hydraulic Laboratory:*—R. W. Angus, R. Taylor.

Departments 1, 2, 3 and 3(a), III Year; one 3 hour period per week, second term.

Departments 6, 7, III Year; 4 periods of 3 hours each.

The work in this course is intended to illustrate the lecture course given in hydraulics and to give the student some working acquaintance with the formulae met with in practice. Experiments are made to determine the coefficients for orifices of the various types used in practice and for a weir. The results of these experiments are used in measuring the discharge in subsequent experiments on meters and for the determination of hydraulic resistances in various cases of flow in pipes. The complete course illustrates very fully the application of the course of lectures to actual cases.

207. *Hydraulics:*—R. W. Angus.

Departments 1 (d), 3 and 7 (d), IV Year; 1 lecture per week, both terms.

A course of lectures dealing with the various problems of unsteady flow such as occurs in power lines, penstocks, etc. Much of the work is done by the process of arithmetic integration, and

the lecture work is supplemented by problems solved by the students in the work rooms, the time for which is included in course 209. Surges, water hammer, stream flow data, etc., are discussed.

The problems of collection of water for power purposes, use of the mass curve, rainfall and evaporation, turbine governing, etc., are also treated as far as possible.

208. *Hydraulics:*—R. W. Angus.

Departments 1 (d), 3 and 7 (d), IV Year; 2 lectures per week, both terms.

The most important question considered and to which most of the lectures are devoted is the theory of turbines and centrifugal pumps, the effect of the design on the speed, discharge and efficiency being fully taken up. The course includes the selection of turbines and pumps for given service intakes, draft tubes and all matters connected with hydraulic power plants.

209. *Hydraulics:*—R. W. Angus, R. Taylor.

Departments 1 (d) and 7 (d), IV Year; about 10 hours per week in 3 hour periods, both terms; Department 3, average of 7½ hours per week in 3 and 2 hour periods.

A laboratory course devoted to experimental work on turbines of various types and centrifugal and turbine pumps and other similar devices. This experimental work is arranged to illustrate the lectures on turbine and pump design. The experiments are made on hydraulic models and on two large turbine pumps used in the laboratory supply, as well as on apparatus specially designed for instruction. Various methods of measuring water-power and the efficiency of machines are also given. A list of the equipment now available, and which is used in this course, is given at the end of the Calendar.

210. *Hydraulic Laboratory;*—R. W. Angus, R. Taylor.

Department 8, IV Year; 3 hours per week, second term.

A laboratory course of experiments on orifices, weirs, meters, etc. See No. 206.

211. *Hydraulics:*—R. Taylor.

Department 1_b, 1_e, IV Year; one hour lecture per week, first term.

A laboratory course of 3 hours per week, first term, on measurement of water, flow in open channels and on pumps.

HEAT ENGINES

216. *Steam and Heat Engines:*—E. A. Allcut.

Departments 3 and 7, II Year; 1 lecture per week, both terms.

Departments 2 and 8, II Year; 1 lecture per week, first term.

A course of lectures dealing with the history and development of the steam engine with special reference to the theory and design of valves and valve operating mechanisms. The principles of heat engines and the various forms of heat engine are also discussed briefly.

217. *Thermodynamics:*—E. A. Allcut.

Departments 3, 3(a), 6 and 7, III Year; 2 lectures per week, both terms.

In this lecture course the laws of heat are used to develop the characteristic equation for a perfect gas and the use of thermal lines on the pressure-volume diagram. The properties of Carnot's cycle are then considered, followed by application of these principles to the hot-air engine, internal combustion engine and air compressor. A consideration of the properties of vapours and their application to the steam engine cycle concludes the course.

218. *Heat Engines:*—E. A. Allcut.

(*a*) Departments 3, 7 and 8, III Year; 1 lecture per week, both terms.

Department 3(*a*), III Year; 1 lecture per week, first term.

This course of lectures is intended to supplement the general lecture course in Thermodynamics by showing the practical application of the laws discussed therein. The laws of combustion, their application to the boiler practice and the generation and uses of steam are the principal points considered.

(*b*) Department 3, III Year; 1 lecture per week, both terms.

Department 3(*a*), III Year; 1 lecture per week, first term.

These lectures are a further development of the internal combustion work commenced in the Second Year, the influence of thermodynamic considerations on the design of heat engines, and problems in heat transfer, being discussed. The laws of heat transmission and their influence on Heating and Ventilation problems are also considered.

219. *Thermodynamics and Mechanical Laboratory:*—R. W. Angus, E. A. Allcut, G. H. Harlow.

Departments 3 and 3(a), III Year; one 3 hour period per week, both terms.

Department 7, III Year; 3 hours per week, first term; 1 hour per week, second term. Time to be in three-hour periods.

This laboratory course is designed to assist in a clearer understanding of thermodynamics, machine design and mechanics of machinery. The work in thermodynamics consists in the setting of slide valves, indicating engines measuring the brake horse-power, simple en-

gine and boiler tests and the testing of gas and gasoline engines under various conditions. The mechanical laboratory work deals with the efficiency of belts as well as of several machines of simple construction. An examination of lubricating oils is also made by means of well-known methods. Experiments are also made on the balancing of reciprocating and rotating masses.

220. *Thermodynamics:*—E. A. Allcut.

Departments 3 3(a) and, 7(f), IV Year; 2 lectures per week, both terms.

This is a continuation of course 217, the general thermodynamic theory being studied from the conception of the thermodynamic surface. The theory of the flow of gases and vapours through orifices, nozzles and pipes is then discussed and its application to the various forms of turbines is outlined. Following this, the principles of refrigeration, binary fluid engines, internal combustion engines and heat transmission are dealt with.

221. *Heat Engines:*—E. A. Allcut.

Departments 3 and 7 (f), IV Year; 1 lecture per week, both terms.

This course is a continuation of the lectures on heat engines given in the Third Year, with special application to the steam power plant. The causes of the various losses occurring in steam engines and the considerations that influence them are studied in detail. Special attention is given to condensing plants, consumption records and other factors upon which the efficiency of a power plant depends; also problems in heat transmission.

222. *Thermodynamics;*—R. W. Angus, E. A. Allcut, G. H. Harlow.

Departments 3 and 3(a), IV Year; average 7½ hours per week, and 7(f), IV Year about 9 hours per week, all in 2 or 3 hour periods.

The work in this year is a continuation and extension of the work covered in the third year laboratory course. Careful tests are made of heaters and of engines of various types, such as simple, tandem and cross-compound steam engines; steam turbine; refrigerating machine; injectors and steam pumps, etc.; and an application is made of Hirn's analysis and the entropy diagram to the results obtained. A complete set of experiments is made on each machine and the result plotted so as to show clearly to the student the effect of various alterations in the adjustment of the engine on the resulting efficiency.

Several modern gas and gasoline engines give ample opportunity for the study of this type of engine, and facilities are provided for sampling the gas supply and exhaust.

Two experimental stacks and three boilers enable results to be obtained on boiler efficiency and chimney draft.

223. *Thermodynamics:*—E. A. Allcut.

Departments 1, 8 and 8 (a), III Year; 1 lecture per week, both terms. Department 2, IV Year; 1 lecture per week; both terms.

The general principles of thermodynamics, the properties of a perfect gas and their application to the Carnot cycle are first studied. This is followed by a consideration of the air compressor cycle, some details of air compressor operation and the theory of the flow of air through pipes and orifices. The properties of vapours and the principles of steam engine operation are also discussed.

224. *Thermodynamic Laboratory:*—G. H. Harlow.

Departments 1, 6 and 8 (a), III Year; seven three hour periods, second term; Department 8, III Year and Department 2, IV Year; 3 hours per week, first term.

A course of experiments with steam and gas engines, compressed air, etc.

225. *Motive Power:*—R. W. Angus.

Department 1 (e), IV Year; one hour per week, both terms.

A course of lectures covering boiler capacity, locomotive horse-power, tractive effort, etc., necessary to carry specified trains over different conditions of roadbed.

MACHINERY

230. *Theory of Mechanism:*—J. H. Parkin.

Departments 3 and 7, II Year; lectures 2 hours per week; problems 1½ hours per week, both terms.

This course of lectures treats of the elementary construction of machines and of the motions of the various parts. Methods of determining linear and angular velocities, methods for the solution of elementary problems involving forces and methods for the determination of the mechanical efficiency of machines are discussed. Velocity diagrams, crank effort and torque diagrams are plotted. Cams, toothed gearing and various types and applications of trains of gearing are considered.

Applications of the methods described are made to various machines including engines, machine tools, link motions, etc., and the lecture work is followed up by the solution of numerous examples in the drafting room.

Text Book:—Theory of Machines—Angus.

231. *Mechanics of Machinery.*—J. H. Parkin.

Departments 3, 3*a* and 7, III Year; 1 hour per week, both terms.

This course is devoted to a consideration of accelerations in machines, acceleration and inertia forces and effects, balancing of machines, kinetic energy of machines, speed fluctuations, proper weight of fly-wheel.

The methods of analysis employed are those developed in course 230.

Text Book:—Theory of Machines—Angus.

232. *Elementary Machine Design:*—W. G. McIntosh.

Departments 3, 6 and 7, II Year; 1 hour per week, both terms.

This is a preparatory course intended to familiarize the student with the different shop methods and processes, casting, forging, machining, etc., used in the production of machine parts, to enable him to make proper provision in the design of such parts to facilitate their production.

In addition, the various standards, machine and pipe threads, tapers, pipe fittings, etc., are described and mechanical drafting room practice explained.

Tolerances, limits, fits and gauges are discussed.

The design of simple machine fastenings and parts is taken up and examples worked out in the drafting room.

233. *Machine Design:*—W. G. McIntosh.

Departments 3, 3(a) and 7, III Year; 2 lectures per week, both terms.

The design work averages 7 hours per week for Department 3, and 4 hours per week for Department 7, the periods to be of not less than 2 hours' duration.

The lectures in this course deal with the design of various machine elements, including screw threads for fastening and power transmission, shafting, bearings (journal, thrust, ball and roller), belts, pulleys, spur gears, fly-wheels, keys, clutches, springs, etc.

The problems worked out in the drafting room are planned to include the design of all of the above and with a view to developing the student's judgment and sense of proportion in design.

Text Book:—Principles of Machine Design—Norman.

234. *Machine Design:*—W. G. McIntosh.

Departments 2, 6, 8 and 8*a*, IV Year; 1 lecture per week, both terms.

The design work occupies 3 hours per week for the second term only.

The lectures in this course deal with the design of various machine elements, particularly those likely to be met with in Chemical and Metallurgical plants, and in mining work.

The problems worked out in the drafting room are designed to give the student training in the general lay-out of shafting and plant machinery, as well as in the design of simple parts for chemical and metallurgical apparatus, and mine machinery.

235. *Advanced Machine Design.*—J. H. Parkin, W. G. McIntosh.

Department 3, IV Year; 2 lectures per week.

The design work averages 7 hours per week, the periods to be of not less than 2 hours' duration.

The lectures of this course deal with the design of machine frames, hooks, hoisting equipment, crank shafts, gears of various kinds (herring-bone, bevel, screw) worm gearing, clutches and brakes.

The work in the drafting room is devoted to the design of complete machines with the object of giving the student practice not only

in the design of various details, but also in working the various elements into a machine of smooth and harmonious design. The machines chosen as examples for design involve as many new machine elements as possible in order to broaden the training of the student.

Text Book:—Principles of Machine Design—Norman.

MATHEMATICS

236. *Calculus:*—M. A. Mackenzie, S. Beatty.

All Departments, I Year; 2 hours per week, each term.

Treatment of limits with special reference to those pertaining to exponentials and logarithms. Derivation of the fundamental formulae of the differential and integral calculus, with early application to simple problems concerning graphs, areas, volumes, lengths, centres of gravity and moments of inertia.

237. *Calculus:*—M. A. Mackenzie, S. Beatty.

Departments 1, 3, 6 and 7, II Year; 2 hours per week, each term.

Continuation of course 236. The elementary theory reviewed and extended. Special attention to applications with problems in Engineering mostly in view.

237*a*. *Advanced Calculus.*—A. W. Tucker.

Department 3a, III Year; 2 hours per week, each term. The main topics in the course are partial differentiation, multiple integration and the solution of differential equations, with exercises and supervision of work.

238. *Analytical Geometry:*—I. R. Pounder, D. A. F. Robinson.

All Departments, I Year; 1 hour per week, first term, 2 hours per week, second term.

The course in Elementary Analytical Geometry covers the more familiar propositions in connection with the straight line, circle, parabola, ellipse and hyperbola. The subject is treated so as to illustrate the general methods of analytical geometry.

239. *Trigonometry, Spherical:*—J. W. Melson.

Department 1, II Year; 1 hour per week, second term.

A course of lectures includes the derivation of formulæ and their application to the solution of triangles and to practical problems.

Text Book:—Spherical Trigonometry—Todhunter and Leatham.

240. *Least Squares, Method of:*—L. B. Stewart.

Department 1, III Year; 1 hour per week, second term.

The course of lectures includes: The general principles of probability, the law of error, direct measurements of equal and different weights; mean square and probable errors; indirect measurements; conditioned observations; applications to empirical constants and formulæ, etc.

Text book:—Least Squares—Merriman.

METALLURGY

241. *Elementary Metallurgy:*—G. A. Guess.
Departments 1, 2, 3, 6 and 8, II Year; 1 hour per week, second term.
A course of about 12 lectures on furnace metallurgy and present practice, with special reference to iron and steel.

242. *Fuels and Combustion:*—G. A. Guess.
Department 8, II Year; 1 hour per week, both terms.
A lecture course dealing with fuels, their use, preparation, calorific value and combustion.

243. *Metallurgy:*—G. A. Guess.
Departments 2, 6, III Year; 1 hour per week, both terms.
Fuels, temperature of combustion, specific heat, conductivity and problems thereon; chimneys, furnaces, refractories, outline of furnace metallurgy and hydro-metallurgy.

244. *Physical Metallurgy:*—J. A. Newcombe.
Departments 3, 3(a), 6 and 7, III Year; Department 2, IV Year; 2 hours per week, second term.
The physical properties and structure of iron and steel and the more common alloys.

245. *Metallurgy:*—G. A. Guess, J. E. Toomer.
Department 8, III Year; 2 hours per week, first term; 1 hour per week, second term.
A lecture course on General Metallurgy accompanied by 3 hours laboratory per week, first term, and 6 continuous hours per week second term.

246. *Physical Metallurgy:*—J. A. Newcombe.
Department 8, III Year; 1 hour per week, both terms.
Changes of phase and of state, pyrometry, preparation of alloys, miscibility of metals, binary, ternary and complex alloys, the use of the microscope, with 3 hours laboratory per week, first term.

247. *Metallurgy:*—G. A. Guess, J. E. Toomer.
Departments 2 and 6 (k), IV Year; 1 hour lecture per week, both terms; 6 continuous hours laboratory per week, second term.
General metallurgy and metallurgical problems.

248. *Metallurgy Problems:*—G. A. Guess, J. E. Toomer.
Department 8, IV Year; 2 hours lecture and 4 hours laboratory per week, both terms.
Metallurgical book-keeping, balance sheets, thermal balance sheets, methods and processes.

249. *Metallurgy:*—G. A. Guess.
Department 8, IV Year; 1 hour per week, both terms.
Critical reading and discussion of papers and articles, describing metallurgical processes or dealing with plant arrangement and construction. Metallurgical flow sheets of typical plants.

250. *Physical Metallurgy:*—J. A. Newcombe.
Departments 6 (k) and 8, IV Year; 1 hour lecture and 3 hours laboratory per week, both terms.

251. *Metallography:*—J. A. Newcombe.
Department 2, IV Year.
A laboratory course of 3 hours per week, second term.

252. *Physical Metallurgy:*—J. A. Newcombe.
Department 1 (c), (d) and (e), IV Year; 1 hour per week, both terms.
The physical properties of metals and alloys used in Civil Engineering practice—specifications.

253. *Heat Treatment of Iron and Steel:*—J. A. Newcombe.
Departments 3 and 3(a), IV Year; 1 lecture per week, both terms.
Heat treatment of iron and steel, case carburizing, case hardening and malleableizing.

CERAMICS

254. (*a*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 4 hours per week, first term; 2 hours per week, second term.
Lectures covering origin, properties and classification of clays and other ceramic materials from a mnaufacturing standpoint; methods of manufacture, including preparing, shaping and burning clay ware.

254. (*b*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 2 hours per week, second term.
Lectures on the composition of clear and coloured glazes.

254. (*c*) *Ceramics:*—J. E. Toomer.
Department 8 (a), III Year; 1 hour per week, second term.
Lectures and problems on calculations necessary for the compounding of ceramic bodies and glazes.

254. (*d*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), III Year; 6 hours per week, both terms.
Work on the identification and testing of clays.

254. (*e*) *Ceramics:*—J. E. Toomer.
Department 8 (a), III Year; 6 hours per week, both terms.
Laboratory practice in the analysis of ceramic materials.

254. (*f*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 2 hours per week, first term.
Lectures on composition and properties of refractory material; composition of bodies made with ceramic material, with special reference to white-ware and porcelain.

254. (*g*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 2 hours per week, second term.
Lectures on the manufacture and composition of glass; manufacture and composition of iron enamels.

254. (*h*) *Ceramics:*—R. J. Montgomery.
Department 8 (a), IV Year; 1 hour per week, second term.
Lectures on specifications, testing and methods of testing ceramic materials.

254. (*i*) *Ceramic Laboratory:*—R. J. Montgomery.
Department 8 (a), IV Year; 9 hours per week, both terms.
Advanced work on compounding and testing ceramic bodies and glazes.

MINERALOGY

255. *Elementary Mineralogy:*—J. E. Thomson.
Department 2, I Year; Department 8 (a) III Year; 2 hours per week, first term.
After introducing the student to the chief chemical, physical, and crystallographic characteristics of minerals, the course becomes descriptive and deals with about one hundred of the minerals most important from the industrial or scientific point of view.
Text Book:—Text-book of Mineralogy—Dana.

256. *Mineralogy:*—J. E. Thomson.
Departments 6 and 8, I Year; 2 hours per week, first term; 1 hour per week, second term.
Introduction to determination of minerals by inspection and physical tests.
Text Book:—Mineral Tables—Eakle.

257. *Primary Mineralogy:*—A. L. Parsons.
Department 1, II Year; 2 hours per week, first term.
A very brief introduction to the study of minerals and rocks.
Text books:—Study of Minerals and Rocks—Rogers; Hand-Book of Rocks—Kemp.

258. *Mineralogy:*—J. E. Thomson.
Department 2, I Year; 1 hour per week, first term; 3 hours per week, second term.
Department 8 (a), III Year; 1 hour per week, first term.
Determination of minerals by inspection and by means of physical tests; introduction to blow-pipe practice.
Text books:—Mineral Tables—Eakle; Determinative Mineralogy—Lewis.

259. *Mineralogy:*—A. L. Parsons, J. E. Thomson.

Department 1, II Year; 1 hour per week, first term; 2 hours per week, second term.

Determination of minerals by inspection and by means of physical tests; study of common rock types and their identification.

Text books:—Mineral Tables—Eakle; Handbook of Rocks—Kemp.

260. *Elementary Petrography:*—T. L. Walker.

Department 2, II Year, and Department 8 (a), III Year; 1 hour per week, both terms.

A course of lectures and laboratory work introducing the student to the macroscopic study of rocks.

Text books:—Handbook of Rocks—Kemp.

261. *Mineralogy:*—J. E. Thomson.

Department 2, II Year; 2 hours per week, both terms.

Determination of minerals by means of the blow-pipe and physical properties.

Text books:—Mineral Tables—Eakle; Determinative Mineralogy—Lewis.

262. *General Petrography:*—A. L. Parsons.

Department 2, III Year, and Department 8 (a), IV Year; 1 hour per week, both terms.

Study of the chief rock-forming minerals and of some phases of petrography not covered in the course of the previous year.

Text Books:—Minerals in Rock-Sections—Luquer; Petrology for Students—Harker.

263. *Petrography:*—T. L. Walker.

Department 2, III Year, and Department 8 (a), IV Year; 2 hours per week, both terms.

Study of the chief rock-forming minerals, of rocks in thin sections and in hand specimens.

Text books:—Petrology for Students—Harker; Minerals in Rock Sections—Luquer.

MODERN LANGUAGES

264. *French.*—F. C. A. Jeanneret, Miss J. C. Laing, M. Poirier, G. L. Assié.

Required in Department 4, I and II Years; 2 hours per week, both terms; III Year, 1 hour per week, both terms.

(*a*) Practice in translation of selected texts bearing on some phase of architectural study.

(*b*) A course in Conversation to encourage the student to acquire a speaking knowledge of the language.

265. *German.*—G. H. Needler, T. J. Hedman, G. E. Holt.
Department 6, all years; I Year, 2 hours per week, both terms; II, III, IV Years, 1 hour per week, both terms.
An elementary course intended to train the student in the translation of scientific journals and treatises.

266. *Spanish:*—M. A. Buchanan, Miss H. M. Wickware.
Departments 6*k*, IV Year; 8, II Year; 1 hour per week, both terms.
An introduction to Spanish grammar, pronunciation and practice in reading Engineering Spanish.

MUNICIPAL ENGINEERING

267. *Sanitary Engineering:*—P. Gillespie.
Department 1b, IV Year; 1 hour lecture per week, both terms; 3 hours laboratory, first term; and 6 hours, second term.
Consideration is given to the problems of water supply, sewerage and sewage disposal as viewed by the engineer. Some practice in the design of works from assumed data is afforded. Excursions to places of interest are arranged from time to time.
Reference Books:—Public Water Supplies—Turneaure and Russell; American Sewerage Practice—Metcalf and Eddy, 3 vols.

268. *Highway Engineering:*—A. T. Laing.
Department 1b, IV Year; 1 hour lecture and 3 hours laboratory per week, both terms.
This course of instruction deals with the design, construction and maintenance of public highways and street pavements, also with the properties of the materials employed. Accompanying the course of lectures is a laboratory course dealing with subsoils, bituminous and non-bituminous materials of construction. Excursions to places of interest are arranged for during the fall term.

269. *Municipal Government and Administration:*—P. Gillespie, A. T. Laing.
Department 1b, IV Year; 4 hours per week both terms.
A lecture course and seminar dealing with local improvement laws, assessments, building codes, fire control and public utilities; reading, essay writing and discussions of problems relating to municipal government, highway transportation, town planning, sanitation and kindred subjects.

SURVEYING

270. ***Surveying:*****—S. R. Crerar.**
Departments 1, 2, 3, 7 and 8, I Year; 1 hour per week, both terms.
The lecture course includes the general principles; surveying with the chain, the compass and chain and the transit and chain, and

level, the applications of trigonometry to inaccessible heights and distances; mensuration of surfaces, co-ordinate surveying, division of land, etc.

Text books:—Plane Surveying—Tracy; Theory and Practice of Surveying—Johnson and Smith; Elementary Surveying—Breed and Hosmer.

271. ***Field Work:***—S. R. Crerar, J. W. Melson.

Departments 1, 2, 3, 7 and 8, I Year; 6 hours per week, first term.

This course comprises testing chains; practice in chaining; a complete survey of a piece of land with the chain and transit; keeping of field notes; the use of the transit and compass in surveying closed figures and traverse lines and in ranging straight lines; plotting by latitudes and departures, and otherwise computing areas. Instrumental work with level, including roadway improvement.

272. ***Surveying:***—W. M. Treadgold.

Department 1, II Year; 1 hour per week, both terms.

This course of lectures takes up in detail, simple, reverse and compound curves as applied to railroad surveying. It also includes stadia, plane table and photographic surveying as applied to topographic work, and the main features of mine and hydrographic surveying.

Text books:—Henck, Searles, Allen (Field books for Engineers) Theory and Practice of Surveying—Johnson and Smith; Surveying—Breed and Hosmer.

272 (*a*). *Surveying:*—E. W. Banting.

Department 2, II Year; 1 hour per week, both terms.

This course of lectures takes up mine surveying with problems related thereto. It also includes the simple curve as applied to railroad surveying, stadia topographical surveying, plane table and the main features of hydrographic surveying.

Text books:—Surveying—Breed and Hosmer; Mine Surveying—Durham.

273. ***Field Work:***—W. M. Treadgold, E. W. Banting.

Department 1, II Year; 9 hours per week, first term.

Department 2, II Year; 6 hours per week, first term.

This course of instruction embraces all adjustments of the transit and level, minor problems in triangulation and traversing—levelling and plane table practice.

274. ***Surveying and Levelling:***—W. M. Treadgold.

Department 1, III Year; 1 hour per week, both terms.

This course of lectures takes up the work of the railroad engineer on construction, including profiles, cross sectioning, computation of

volume of earthwork, overhaul, transition curves, laying out turnouts, frogs and switches, etc.

Also a discussion of trigonometric and barometric levelling

Text books:—Field Engineering—Searles; Railroad Curves and Earthworks—Allen.

275. *Survey Camp:*—W. M. Treadgold, S. R. Crerar, E. W. Banting, J. W. Melson.

Departments 1 and 2, III Year; Department 1a, IV Year.

This course includes:

(*a*) Secondary Triangulation and Base Line Measurements.
(*b*) Stadia, Plane Table and Boundary Traverses.
(*c*) Highway and Railway Location.
(*d*) Cross Sectioning and Computation of Earthwork.
(*e*) Stream Gauging and Discharge Measurements.
(*f*) Hydrographic Surveying.
(*g*) Photographic and Micrometer work.
(*h*) Stadia and Plane Table Topography.
(*i*) Mine Surveying.
(*j*) Observations for Time, Azimuth and Latitude.
(*k*) Geological Survey.

This work is taken at University Survey Camp. See page 38.

276. *Railroad Location and Design:*—W. M. Treadgold.

Department 1 (e), IV Year; 1 hour lecture per week, both terms; about 8 hours per week, both terms, in the drafting room.

This work will consist of an original survey for a railroad some one or two miles in length, the work to be carried out according to the most modern methods of location. Upon the completion of the field work, the complete survey will be plotted and a line adjusted to it. This will be staked out, profiles taken and the computation made of the earthwork and the preparation of overhaul diagram compiled for determination of haul and borrow. In the second term the design of track work, yards and practical problems will be taken up and special problems assigned.

PHYSICAL TRAINING

280. *Physical Training*:—G. D. Porter.

Required in all departments, I and II Years, and optional in the III and IV. Years.

By order of the Board of Governors each male student proceeding to a degree must take Physical Training in the first and second years of his attendance. In each session in which Physical Training is compulsory he must first undergo a medical examination by the Director of the University Health Service, and must then

register for Physical Training at the office of the Athletic Association in Hart House. Students of all years who wish to take part in any form of athletics or physical exercise, must first undergo a medical examination by the Director. Those classified as A1 may elect to take any form of competitive athletics during the season in which that form of sport is in progress.

Military training in the C.O.T.C. constitutes an option in Physical Training (see page 137).

283. *Zymology:*—H. B. Speakman.

A study of the phenomena of fermentation and their industrial applications.

THESIS

285. *Thesis.*

Required in all Departments, IV Year, with the exception of Department 4, Architectural Design Option. Department 3, IV Year; 1 hour per week, both terms. For requirements in Department 2 see sec. 67.

Each student must prepare a thesis on a subject and in a form approved by the head of the department in which the student is registered.

AERONAUTICS

301. *Elements of Aviation.*—J. H. Parkin.

Department 3(a), III Year; 1 hour per week, both terms.

An introductory course of lectures covering classes of aircraft, types of aeroplanes, elementary construction of aeroplanes, principles of flight (including elementary consideration of performance and longitudinal balance). Aerofoil action, characteristics and coefficients.

302. *Aerodynamics I.*—J. H. Parkin.

Department 3(a), III Year; 2 hours per week, second term.

A lecture course dealing with standards and units, properties of air, standard atmosphere, coefficients, theory of model testing and dynamical similarity, scale effect, methods and apparatus of test, aerodynamic properties of aerofoils and aerofoil combinations, parasite drag.

303. *Aerodynamics II.*—J. H. Parkin.

Department 3(a), IV Year; 1 hour per week, both terms.

A continuation of course 302, dealing with aerofoil theory, aeroplane stability and control, aeroplane performance analysis and calculation, special types of aircraft.

304. *Aerodynamic Laboratory:*—J. H. Parkin.
Department 3(a), IV Year; 6 hours per week, both terms.
Calibration and use of instruments, experimental determination of the air forces and moments on model wings, aircraft components and complete aircraft. Pressure plotting, air flow studies.

305. *Aircraft Materials:*—J. H. Parkin.
Department 3(a), IV Year; 1 hour per week, first term.
Properties of timber, plywood, fabric, dopes, glue, rubber, light alloys, special steels and of spars and struts of special form, welded connections, tubes, cables.

306. *Aeroplane Design and Stress Analysis:*—J. H. Parkin.
Department 3(a), IV Year; 2 hours per week, 6 hours per week in drafting room, both terms.
Load factors, design for aerodynamic and structural requirements. Stresses during different manœuvres, form, arrangement and design of details.

307. *Aircraft Propellers.*—J. H. Parkin.
Department 3(a), IV Year; 1 hour per week, both terms.
The theory, design and construction of aircraft propellers and windmills.

308. *Aircraft Engines:*—E. A. Allcut.
Department 3(a), IV Year; 1 hour per week, both terms.
A study of the special features of aircraft motors, examination of the different types, special auxiliaries and accessories.

SCHOOL OF ENGINEERING RESEARCH

A School of Engineering Research, within the Faculty of Applied Science and Engineering, was established in the Spring of 1917 at the suggestion of the late Dean Ellis.

The School is under the direct supervision of a Committee of Management composed of fifteen Members of the Faculty Council. To this Committee is entrusted the selection of researches to be undertaken under the auspices of the School, and the disposition of funds conducting them.

The School was organized chiefly for the training of graduates in methods of research, and for the carrying out of investigations. These latter may be problems relating to specific industries or raw materials and having a specific end in view, or general problems having to do with fundamental principles.

A number of research assistants are appointed annually in the various departments of the Faculty to carry on the work of research under direction of members of the staff. The facilities of the School are also open to graduates who desire to penetrate more deeply into particular phases of experimental work, or to undertake investigations either suggested by members of the staff or arising from their own work since graduation.

Address communications to the Secretary—Professor Maitland C. Boswell, Ph.D.

ADVANCED COURSE IN HYDRO-ELECTRIC POWER

In view of the importance of Hydro-Electric power in Canada, further facilities are offered to those graduates who wish to supplement the present extensive undergraduate courses bearing upon this subject. Graduate studies may be pursued by candidates for the Degree of Master of Applied Science as soon as desired after graduation.

To those returning after satisfactory experience in some approved phase of Hydro-Electric work, somewhat more specialized courses may be given than are possible with very recent graduates. The Engineering Alumni Association of the University has expressed its willingness and desire to assist such candidates in obtaining suitable employment to fit them for these courses of study, but such courses are available only to those with the proper undergraduate preparation.

Graduates who may wish to avail themselves of the arrangements proposed are advised to communicate with the Dean.

It should be noted that candidates for post-graduate degrees register with the Secretary of the School of Graduate Studies. For further particulars see Calendar of the School of Graduate Studies and succeeding pages of this Calendar.

REGULATIONS FOR DEGREES OF MASTER OF APPLIED SCIENCE, MASTER OF ARCHITECTURE, CIVIL ENGINEER, MINING ENGINEER, MECHANICAL ENGINEER, ELECTRICAL ENGINEER, CHEMICAL ENGINEER, METALLURGICAL ENGINEER

A. The regulations governing the Degrees of Master of Applied Science and Master of Architecture for the session 1929-30 shall be determined as follows:

1*a*. A candidate for the degree of Master of Applied Science shall hold the degree of Bachelor of Applied Science of this University or a degree from some other University recognized as equivalent by the Council of the School of Graduate Studies.

1*b*. A candidate for the degree of Master of Architecture shall hold the degree of Bachelor of Architecture or the degree of Bachelor of Applied Science in Architecture of this University or a degree from some other University recognized as equivalent by the Council of the School of Graduate Studies.

2. He shall register with the Secretary of the School of Graduate Studies at the beginning of the academic year.

3. Not later than November 1, 1929, he shall submit to the Secretary for acceptance by the Council of the School of Graduate Studies the title of his proposed thesis as approved by the department concerned.

4. Not later than April 30, 1930, he shall present evidence to the Council of the School of Graduate Studies that he has spent not less than one academic year of the department concerned as a student enrolled in one of the following departments on a course of study approved by the department: Civil Engineering, Mining Engineering, Mechanical Engineering, Architecture, Chemical Engineering, Electrical Engineering, Metallurgical Engineering.

5. Not later than April 30, 1930, evidence that the candidate has satisfactorily met all the requirements of the department with regard to thesis and to such examinations as the department shall require, shall be forwarded to the Council of the School of Graduate Studies through the sub-committee administering the regulations governing the degrees of Master of Applied Science and Master of Architecture.

B. The regulations governing the Professional Degrees of Civil Engineer (C.E.), Mining Engineer (M.E.), Mechanical Engineer (M.E.), Electrical Engineer (E.E.), Chemical Engineer (Chem.E.), Metallurgical Engineer (Met.E.), for the Session 1929-30 shall be determined as follows:

1. A candidate for one of the said degrees shall hold the diploma of the School of Practical Science or of the Faculty of Applied Science and Engineering or the degree of Bachelor of Applied Science, or shall have spent not less than two years as a member of the teaching staff in this Faculty after having graduated in Engineering from another institution of recognized reputation.

2. He shall have spent at least three years after receiving the diploma or the degree in the actual practice of the branch of engineering wherein he is a candidate for a degree.

3. Intervals of non-employment, or of employment in other branches of engineering, shall not be included in the above three years. It shall not be necessary that the several periods requisite to make up the said three years be consecutive.

4. Notice in writing shall be sent to the Secretary not later than the first day of November, informing him of the degree to which the candidate wishes to proceed and of the title of his proposed thesis for the approval of the Examiners.

5. Satisfactory evidence shall be submitted to the University Examiners as to the nature and length of the candidate's professional experience for the purpose of clauses 2 and 3, *i.e.*, a complete and detailed history of his professional activities from the date of graduation up to the time of application, stressing particularly that part of his experience that gave rise to his desire to prepare a thesis on the subject submitted for the approval of the University Examiners; together with certificate or certificates from former employers substantiating the statements as to the nature and duration of service enumerated.

The examiners may satisfy themeslves by oral or written examinations in regard to the candidate's experience and competence.

6. The candidate shall prepare an original thesis on some engineering subject in the branch in which he wishes a degree, the said thesis to be accompanied by all necessary descriptions, details, drawings, bills of quantities, specifications and estimates.

The candidate may be required at the option of the examiners to undergo an examination in the subject of this thesis.

7. The thesis, with accompanying papers, described in clause 6, shall be sent to the Secretary not later than the first day of March.

8. The candidate shall be required to present himself for examination in the month of April or at such time as may be arranged by the Examiners.

9. The thesis, drawings, and other papers submitted under clause 7 shall become the property of the University.

10. Nothing in this statute shall prevent any candidate from receiving more than one of the said degrees, provided he has the necessary qualifications for each degree. An interval of three years must elapse between the granting of any two degrees under this statute.

DEGREE OF DOCTOR OF PHILOSOPHY

Attention is called to the fact that the degree of Doctor of Philosophy (Ph.D.) is open to graduates of the Faculty of Applied Science and Engineering. Full information as to the conditions to be met by candidates for this degree will be found in the Calendar of the School of Graduate Studies, which may be obtained from the Registrar of the University.

In general this course involves, except under special circumstances, three years study in this University on one major subject and two minor subjects, and every possible effort will be made to meet the desires of candidates in the selection of these subjects.

Several graduates have already taken advantage of the opportunity thus offered, and others interested in this degree are requested to correspond with the Secretary of the School of Graduate Studies and are advised, in the first instance, to consult the Dean of this Faculty.

CERTIFICATE FOR HIGH SCHOOL ASSISTANT

The Calendar of the Ontario College of Education provides for the admission of the holder of a degree in Science to the Course for a High School Assistant's certificate. The regulation requires that the applicant shall submit with his application:

"His certificate of graduation as Bachelor or Master of Arts, Bachelor or Master of Science, Bachelor of Commerce, Bachelor of Agriculture, or Bachelor of Applied Science, from a British University, after the regular university course approved by the Minister of Education as to entrance requirements and as to content of the undergraduate courses. Each applicant must have Upper School or Honour Matriculation standing in English and History and Mathematics or the equivalent of such standing."

SPECIALISTS' CERTIFICATES FOR HIGH SCHOOL TEACHERS

By an arrangement between the University and the Department of Education of the Province of Ontario, provision is made for graduates of the Faculty of Applied Science and Engineering to obtain High School Specialists' Certificates under conditions which can be ascertained by reference to the Special Announcement of the University in connection therewith.

PROVISION FOR SPECIALIST STANDING IN SCIENCE IN FACULTY OF ARTS

A student in the Faculty of Applied Science and Engineering, who has passed the examination of the First and Second Years with honours in any one of the Departments of Civil, Mining, Mechanical, Chemical, Electrical and Metallurgical Engineering, may enter the Third Year of the Honour Course in Physics, provided that he has met the language requirements of the First Year of that course with respect to Latin, English, and French or German at the Honour Matriculation or equivalent examination.

LABORATORY EQUIPMENT

THERMODYNAMIC AND MECHANICAL LABORATORY

The University in 1919 completed the erection of a large, well-equipped building for the accommodation of the steam, gas, mechanical and hydraulic laboratories. A more complete description of the laboratories has been published elsewhere, so that the present description is only intended to give the main features.

The part of the building set apart for thermodynamics and other mechanical work is the ground floor of a room 60 ft. x 155 ft. This room is lighted entirely from the roof in a very perfect way. A part of the space 40 ft. wide running the entire length of 155 feet is served by a 3 ton travelling crane and contains the following equipment:

50 h.p. Brown engine with separate jackets on both heads and barrel of cylinder.

Two-stage Rand air compressor having compound steam cylinders, each fitted with Meyer cut-off gear. The low pressure air cylinder has Corliss inlet gear.

30 h.p. high-speed Leonard tandem compound engine with shaft governor.

15 h.p. high-speed McEwen engine.

40 h.p. Uniflow engine.

25 h.p. General Electric steam turbine.

Two 15 h.p. Leonard engines with different types of valves, which are used for valve setting.

There are also two surface condensers with air pumps so arranged that any engine in the laboratory may be made to exhaust into the atmosphere through an open heater or into one of the condensers, the change from one arrangement to the other being accomplished in a few minutes without the aid of valves.

The laboratory further contains:

A 3 ton York refrigerating machine with tanks.

An Amsler transmission dynamometer.

Apparatus for testing injectors and steam pumps.

Hot blast heating equipment.

Numerous other pieces of apparatus and instruments.

The work on internal combustion engines and producers is performed on the following:

Experimental gas producer.

14 h.p. National gas engine arranged for various compressions and points of ignition.

10 h.p. Fielding and Platt engine for city gas or coal oil, having various adjustments

25 h.p. Allen semi-Diesel engine.

25 h.p. tractor gasoline engine.

Six cylinder Buick automobile engine.

200 h.p. Sprague electric dynamometer.

Various accessories to above machines.

Steam for the laboratory is supplied by two 50 h.p. and one 100 h.p. Babcock and Wilcox boilers, the latter having an internal superheater. These boilers are located in a separate boiler room. They are used for experimental work only and are fitted up for testing. The gases pass up through two independent chimneys, and these have been arranged so that the draft and other conditions in the chimney at any point of its height may be examined.

In smaller work-rooms off the main laboratory are placed belt and oil testing machines, apparatus for testing the efficiency of gears and machines, and for experiments in the balancing of machinery.

HYDRAULIC LABORATORY

The hydraulic laboratory occupies two floors each 40 feet x 112 feet, which are well lighted by large windows on the side and end.

The water for the experimental work is pumped through the various pieces of apparatus from a well by means of two turbine pumping units, both of which are driven by a Belliss and Morcom compound engine of 125 h.p. running at a speed of 525 revs. per minute. Both engine and pumps have been installed with a view to using them in experimental work as well as for supply of water for other apparatus used in the laboratory.

The pumping units are capable of delivering one cubic foot of water per second against heads of 250 feet and 300 feet respectively. These units are designed and connected up so that they may be run in series giving the above discharge at 550 feet head, or they may be run in parallel giving double the discharge at a lower head. Each pumping unit consists of two two-stage pumps mounted on a common base and driven by a single pulley, and the construction and piping are such that each two-stage pump may be driven separately or that all may be driven at once, discharging separately one cubic foot per second at about 125 feet head through each of four independent pipes, or else the pumps may be run in series or in parallel. The scheme is thus well adapted to laboratory work, and under the heads used on reaction turbines about six cubic feet per second may be obtained.

In addition to this there is an electrically driven pump capable of delivering six cubic feet per second at a head of sixty-five feet and which is most helpful in turbine testing. Attention is called to the special turbine testing flume described below.

The laboratory further contains a large vertical steel tank 5½ feet diameter by 34 feet with arrangements for the attachment of nozzles

and other mouthpieces, etc. Connections are also arranged for reaction turbines, the tank acting as a reservoir.

The discharge from the turbines or nozzles is measured in a weir tank nearly 6 feet wide and 21 feet long, containing a contracted weir 4½ feet wide. This weir may be calibrated by two weighing tanks, each having a capacity of about 240 cubic feet.

There are three reaction turbines and two impulse wheels all ready for experiment, the power being measured by brakes and the water by weir or orifices. Amongst the reaction turbines may be mentioned the one designed and built by Escher Wyss & Co., specially for the laboratory.

A new and specially designed turbine testing flume has recently been added to the laboratory, the machinery for which has been largely furnished through the kindness of the Dominion Engineering Works, Montreal, and Wm. Cramp and Sons, Philadelphia. This flume is supplied with water by a Moody spiral pump of twelve cubic feet per second capacity and at present there are two turbines, one of the propeller type, and also two special draft tubes and more will be added. This provides an excellent opportunity for experiment and research.

Smaller orifice and weir tanks, each about 3 x 3 x 12 feet with necessary measuring tanks, are arranged for instruction in coeficients of various kinds and practice with weirs and orifices.

A Venturi meter and other meters, also an hydraulic ram and similar devices are available for testing, and good facilities have been arranged for investigating friction and other properties of pipes and fire hose.

For special investigations on turbine and centrifugal pumps, other pumps in addition to those already described have been arranged.

The basement of the laboratory contains an open trough 5 feet wide, about 110 feet long, with a large weir at one end. It is intended to use this trough for experiments on the flow in open channels, for measurements of large discharges by means of the weir, and for experiments with current meters and Pitot tubes.

Numerous pieces of smaller apparatus, together with all instruments required, have also been provided, and the laboratory equipment is believed to be very complete.

AERODYNAMIC LABORATORY

The Aerodynamic Laboratory is fully equipped with an improved 4-ft. Royal Aircraft Establishment type wind channel, aerodynamic balance, micromanometers and other necessary instruments.

Air speeds of 80 feet per second can be secured in a stream of great steadiness and uniformity and higher speeds with some sacrifice in steadiness.

The work done in the Laboratory includes the investigation of problems in aerodynamics, tests of air craft components, and complete machines, rating of meters, ventilators, radiators, etc., and the study of the effect of wind pressure on structures, chimneys, etc.

ENGINEERING PHYSICS LABORATORIES

Illuminating Engineering

The laboratories are equipped with ordinary and precision photometer benches with integrating mirrors and rotators, photometric spheres from 15 inches to 6 feet, portable illuminometers, spectro-phometer, etc. A room is also provided containing outlets for various types of industrial, commercial and house lighting units, for measurement of illumination values. For work in optics there is provided optical benches for the testing of lenses and instruction in the theory of instruments together with a general equipment of telescopes, field glasses, microscopes, sextants, etc.

Heat and Hydrostatic Laboratory

This laboratory is equipped with a full supply of apparatus required for the practical work in these subjects.

Acoustical Laboratory

The equipment here consists of forks, pipes, sonometers, etc., to illustrate the general work in this subject together with special equipment for work in architectural acoustics as taught to architects.

DONATIONS

Through the generous donations of the manufacturers of lighting equipment and accessories, a Lighting Demonstration Room to illustrate the latest practice in industrial, commercial and house lighting has been established as a permanent exhibit. The following companies have co-operated and their contributions are gratefully acknowledged:

All-American Radio Corp.
Benjamin Electric Co.
Bryant Electric Co.
Canadian General Electric Co.
Canadian Westinghouse Co.
Consolidated Glass Co.
Cutler-Hammer Co.
Cutter Co. per D. M. Fraser Ltd.
Curtis Lighting Inc.
Frank Adam Electric Co. per Taylor Mfg. Co.
Gleason-Fiebout Glass Co.
Hart Mfg. Co. per Bongard Ltd., Ivanhoe Division.
Jewell Instrument Co. per D. M. Fraser Ltd.
Miller Co.
Pittsburg Reflector Co. per Wilson Illuminating Co.
Tallman Brass Co.
Walcott Mfg. Co. per Bongard Ltd.
Wheeler Co. per C.G.E.

PHOTOGRAPHIC AND PROJECTION LABORATORIES

The Photographic Laboratory contains a supply of small cameras for the use of students, enlarging cameras, printers, blue printing machine and the necessary dark rooms.

This Department also carries on a photographic and projection service for all Faculties and Departments of the University. The equipment for this work consists of cameras for making photographs up to full plate size, enlargers, photo-micrographic apparatus, motion picture cameras for both gross and micro work, with the necessary developing and printing machines, a rotary blue print machine, a photostat, etc.

For projection service there is a motion picture projector and a number of projection lanterns for service in any University Building.

ELECTRICAL LABORATORIES

The Department of Electrical Engineering is located in the Electrical Building. The accommodation includes quarters for staff, library, lecture rooms, laboratories, stores, and shop for repairs and construction.

Services.—Three-wire direct-current, 110 kw., from the University power house, automatically regulated at our end for constant voltage of desired value at our main switchboard. Three-phase, 60 cycles, 60 k.v.a., 115 volts, automatically regulated as to voltage and frequency. Three-phase, 25 cycles, 30 k.v.a., automatically regulated as to voltage and frequency. Every laboratory has all three services available at convenient places. There are three main boards, one for each floor. A system of special trunk lines between boards, and tree systems on each floor, enable easy arrangement of any desired special connections from any laboratory to any other.

Alternating current laboratory.—Area 26 x 110 ft., service sets 60 and 25 cycles, Tirrill regulators. Two 60-cycle and two 25-cycle, 15 k.v.a. motor-generator sets; converters; various motors, squirrel cage and wound rotor induction types, repulsion and other single-phase types, unity power factor motor, polyphase motor with variable speed shunt characteristics and speed range of 4 to 1; transformers, single and three-phase; constant-current transformers with load of series arc lamps; lamp racks, reactors, condensers, brakes, etc.; oscillographs; indicating, graphic, recording, and demand meters of the best makes; all arranged to facilitate a very general line of experimental work.

Direct current laboratory.—40 kw. 230 to 115 volt motor generator set with Tirrill regulator for special tests. Numerous 5 kw. to 10 kw. motor-generator sets; shunt, series, compound motors; special interpole machines; loading racks, dynamometers, rheostats, numerous meters of first quality, etc., for any sort of study.

Measurements Laboratory.—26 x 110 ft. Fitted with very flexible storage battery service which can be connected to any desired working place; d.c. three-wire service, also 60 and 25-cycle three-phase everywhere; galvanometers, resistance boxes, bridges, shunts, potentiometers, standard cells, bond testers, ductor, megger, apparatus for measuring low resistances, artificial lines for fault measurements, condensers, inductances, rails, cables, voltmeters, ammeters, wattmeters, dynamometers, etc., for general work on a great variety of measurements.

High voltage laboratory.—For various lines of study with voltages up to 200,000 volts. Flexible and safe provision for control.

Materials laboratories.—One specially fitted for general work on conducting materials, one for magnetic materials, one for dielectric materials.

Radio laboratory.—Adapted for the measurement of various quantities of interest in this work, including the strength of incoming signals. One single conductor aerial 1,000 ft. long, one multi-conductor aerial 120 ft. long.

Standardizing laboratories.—One students' calibration room for direct-current meters, another for alternating-current meters. A standards room, constant temperature, for master standards of voltage, resistance, current, power, etc.

Research laboratories.—Four rooms set apart for this work, in combination with facilities of the other laboratories.

Design laboratory—Arranged for calculation work on apparatus selected to illustrate essential principles.

CHEMICAL LABORATORIES

The Chemical laboratories are situated in the western half of the Chemistry and Mining building, on the first and second floors. The rooms are large and well lighted, and are supplied with the usual modern equipment.

The first and second year laboratory for qualitative work has accommodation for 112 students, each working space being supplied with water, gas and fume cupboard. The laboratory for quantitative analysis will accommodate 48 students, and is supplied with commodious fume cupboards and all necessary apparatus. A laboratory with working places for 36 is provided for the students engaged in the study of technical chemistry; it is equipped with appliances for the preparation and testing of chemical products. Laboratories for fourth year students with accommodation for twenty workers has been fitted up. Each of these laboratories has its own balance room adjoining furnished with instruments from the best makers and adapted to the particular objects in view.

In addition there are rooms set apart for research, for gas analysis, and a specially constructed fireproof laboratory for combustion, crucible and bomb furnaces. Each of these laboratories is supplied with apparatus of the most approved design, providing excellent facilities for the prosecution of work in analytical and technical chemistry.

A room in the basement, set apart for the purpose, has been equipped, as a laboratory for carrying on chemical operations on a small factory scale.

ELECTROCHEMICAL LABORATORIES

The Electrochemical laboratories, which are situated in the Chemistry and Mining building, are provided with special facilities for electrolytic work, including a large storage battery and electroplating dynamo with tanks as well as a good set of apparatus and electrical measuring instruments. The experimental work on electric furnaces is carried out in a large furnace room in the basement, occupied jointly by this Department and the Department of Metallurgy. The equipment for this purpose comprises a 120 KW, 110 volt generator supplying direct current through a switchboard, rheostats, circuit-breaker and instruments to a set of distributing bus-bars, and a 200 KV-a transformer stepping down from 2200 volts to 30-120 volts in 3 and 6 volt steps, which supplies alternating current at 25 cycles. There is a complete set of A.C. instruments, circuit-breakers, oil-switches, relays, automatic regulating winches, etc., and a Northrup high frequency furnace with its transformer is also installed.

ASSAYING LABORATORIES

These are situated in the west end of the basement in the Mining Building. They consist of five rooms, in addition to a library for study and an instructor's room. The East laboratory, 17 x 47 feet, and the West laboratory, 28 x 37 feet, are equipped with coal, oil, gas, and electric furnaces of various design. A Hoskin's electric resistance furnace has an automatic temperature regulator and a voltage control. Each room has a fume cupboard, and the necessary equipment for the wet work in connection with assaying. Accommodation for twenty-four students at a time is provided, by individual work desks, each supplied with a balance, weights, fluxes, tools, drawers and lockers. Common to both laboratories is the balance room which has a cement table on brick piers to support the bead balances. These are illustrative of the types met in practice. The latest model with a sensitivity of 1/500 milligram, is equipped with multiple weight attachment, and a mechanical pan extractor. Adjoining the West laboratory is a research room. A store-room adjoins the East laboratory where fluxes, clay ware and extra parts are kept. In the instructor's room are stored a large number of ores and bullion, obtained chiefly from typical mining districts and metallurgical plants, for class use. The preparation of ores is done in the Milling building, where crushers, pulverizers and sampling devices are available. A special laboratory sampler has been constructed for the purpose of giving samples for the student's assays, of indisputable similarity, thus confining variations in results to the students' work. Other apparatus includes Guess-Haultain stationary electrolytic outfits, King rotating electrolytic apparatus, microscopes, optical resistance and thermocouple pyrometers, hand and foot cupel machines, grinding plates and screens.

MINING AND ORE DRESSING LABORATORY

A detached building 72 ft. x 70 ft. contains the Mining and Ore dressing equipment. It is heated, lighted and supplied with power from the central plant. It is divided into several parts, the larger being 72 ft x 53 ft. by 22 ft. high.

In this room is a 5-stamp battery with amalgamation plates, Wilfley table, Deister Plat-o table, Deister slime table, buddle, and classifiers of sufficient size to make tests on lots of from one to ten tons.

In addition are a set of small Wilfley tables, two 3-compartment jigs, a 2 ft. x 3 ft. tube mill, a small experimental tube mill, agitators, small classifiers and other testing apparatus for experimenting on the falling rates of ore particles, slime settling, surface tension and flotation processes. These include a Case machine, a K. and K. machine, a Ruth machine, a Callow cell, etc. Water is supplied from a tank in the roof. The machinery is all motor driven.

One portion of the room is devoted to rock drills of various types and other mining apparatus.

The other part of the building, 72 ft. x 17 ft., is divided into several rooms and contains a Hadfield's Gyratory Crusher, 16 in. x 12 in. Rolls, small crushers, screening machine, and sampling apparatus. The crushers are driven by a 30 h.p. motor in another room.

The other rooms contain a Wetherill magnetic separator, screen sets, a smithing equipment, workshop and storage for small lots of ore. The larger part of the ore supply is accommodated in bins outside the building.

The plant throughout is intended mainly for teaching and experimental purposes.

There has recently been added apparatus especially designed for research work in various phases of rock crushing and grinding:—Ball Mills with plate glass ends for the study of ball paths; a small Ball and Rod Mill on ball bearings with dynamometer; a set of high grade miniature Rolls in ball bearings with integrating dynamometer.

METALLURGICAL LABORATORIES

This laboratory, in the East end of the Mining building, occupies about 3,600 sq. ft. on the basement floor and the same space immediately above on the ground floor. The basement floor is divided into one large furnace room, a small hydrometallurgical room and two store-rooms. The furnace room contains a motor driven Connersville blower, several gas fired furnaces, two small blast furnaces, and a small 6 hearth Wedge roasting furnace. The larger electric furnaces of the Department of Electrochemistry are in this room. Some are supplied with direct current, others with A.C. from a 200 K.V.A. transformer. A system of flues, with hoods

over all the furnaces, leads through a Cottrell precipitator of the Rathbun type taking current at 50,000 volts, to a stack through which gases are pulled by a fan in the attic.

The hydro-metallurgical room in addition to apparatus for leaching tests contains several natural draft furnaces, a large Hoskins resistance furnace and a 113 lb. drop hammer. There are also tanks for electrolytic refining and precipitation of metals.

The upper floor is divided into laboratories, store rooms and offices. The laboratories are: 1. Metallurgical analysis; 2. Heating treatment and pyrometry; 3. Grinding, polishing and etching; 4. Metallographic room with an adjoining dark room.

In the laboratory for metallurgical analysis the student is given some training in mill and smelter methods of analysis. It is well equipped for this work.

In the heat treatment and pyrometry laboratory are a number of tube furnaces of different sizes, a Leeds & Northrup transformation point indicator with furnace, double thermocouple and twin galvanometer, a Leeds & Northrup potentiometer pyrometer, a disappearing filament pyrometer, and many thermocouples for use with galvanometer or potentiometer. For grinding and polishing there is provided two motor driven emery wheels and a set of 3 motor driven horizontal polishing plates.

The Metallographic room is equipped with the latest type Bausch & Lomb horizontal inverted microscope type of photo micrographic apparatus, an older and horizontal photo micrographic instrument made by Pellin, Paris; two vertical photo micrographic instruments and three other metallographic microscopes.

There are also a Pellin instrument for the determination of critical points by photography according to the Saladin method and a Leeds & Northrup type "K" precision potentiometer, which is also used for the determination of critical points.

The laboratory has a Rockwell hardness testing machine, and a wire drawing bench.

The Ceramic equipment includes:

A dry pan and a vertical pug mill.

A small dry press.

A plunger machine with tile and hollow ware dies.

An Abbé six jar ball mill.

A recuperative down draft clay testing furnace of brick construction.

An oil fired muffle decorating kiln.

A small Seger test furnace.

A high temperature oxygen acetylene furnace.

A high temperature electric muffle furnace with a temperature range up to 1700° C.

Standard screens, volumeters, elutriation apparatus driers and such sundries as are necessary for clay testing.

MECHANICS OF MATERIALS LABORATORY

This laboratory is available for the scientific and commercial testing of materials of construction such as iron, steel, timber, concrete and masonry.

It is supplied with the following:

An Emery 50-ton hydraulic machine, built by Wm. Sellers & Co., of Philadelphia, for making tests in tension and compression.

A 200 ton, three-screw power testing machine, built by Riehlé Bros., Philadelphia. It will make tests in tension, compression, shear and cross-bending, and will take posts 10 feet long and beams of 16 feet in span.

A Riehlé 100 ton screw power universal testing machine, taking posts 12 feet long and beams of 18 ft. span.

A Riehlé 10-ton screw power universal testing machine.

A Riehlé 50-ton screw power universal testing machine.

A 15-ton single lever-machine, built by J. Buckton & Co., Leeds, England.

A torsion machine, built by Tinius Olsen & Co., Philadelphia, for testing the strength and elasticity of shafting. This machine will twist shafts up to 16 feet in length and 2 inches in diameter.

A hand power torsion machine of simple mechanical construction, specially designed for the testing of short shafts of a maximum diameter of one inch.

A Riehlé transverse testing machine of 5,000 pounds capacity, adapted to specimens up to 48 inches in length.

A Riehlé compressometer, with spherical seat attachment for the adjustment of specimens having slightly non-parallel faces. This compressometer will receive specimens up to 10 inches in length.

A set of Riehlé' proving levers with standard weights for calibrating testing machines.

An Amsler calibrating box of 60,000 lb. capacity for calibrating testing machines.

An Olsen compression micrometer of standard type.

A 20,000 pound Olsen, hand power, wire testing machine, specially fitted for testing wooden columns with both fixed and pivoted ends.

An Olsen combined tension and cantilever type impact testing machine.

An Olsen, 20,000 pound, hand power testing machine especially adapted for testing long columns.

An Olsen, 200 pound capacity, textile testing machine.

A Berry strain-gauge for spans of 2 inches and 8 inches.

A Nalder dividing engine. This may be used either for the precise division of scales or for the calibration of instruments intended for refined measurements.

A Brinell hardness testing machine.

An Olsen Brinell Proving Ring 3,000 kg. capacity for checking the Brinell Hardness tester.

A Firth Hardometer with diamond and ball attachments for hardness testing.

A Shore scleroscope for testing hardness.

A Fereday-Palmer stress recorder by T. Cooke & Sons, Ltd., London.

Four Beggs deformeter gauges with necessary plugs and accessories for investigating stresses in structures by means of models.

A large number of extensometers of the usual degree of precision. These include the Bauschinger, Martens, Unwin, Ames, Riehlé, Johnson, Henning (recording) and other types. In addition there are the usual scales, micrometers, telescopes and reflectors, voltmeters for the determination of metallic contact, and such other appliances as are necessary in the making of precise measurements.

The shop is equipped with a number of high-class machine tools specially fitted for reducing the specimens to the requisite shapes and dimensions with a minimum of hand labour. It is also supplied with the necessary appliances for making ordinary repairs and for making apparatus for special experiment and original investigation.

HIGHWAY LABORATORY

ROAD METALS AND SUBGRADE SOILS

This laboratory is equipped for carrying out investigations in the various materials employed in highway construction and maintenance, and comprises the following:

A Page impact machine for testing the toughness of road materials.

A diamond core drill for preparing specimens for the toughness test.

A Deval abrasion machine for testing the resistance to wear of road materials.

A cementation testing apparatus (Page type) for determining cementing properties of road materials.

A jaw crusher (Mitchell type) for crushing rock for various tests.

A power driven agitator with sieves for the mechanical analysis of sand, gravel and crushed rock.

A Dorry hardness testing machine for determining the hardness of rock used in road construction.

A Riehlé standard brick-rattler.

A mechanical centrifuge for determining moisture equivalent of soils and apparatus for determining volumetric changes, capillary moisture and other properties of subsoils of interest to the highway engineer.

BITUMENS

This laboratory is designed for the investigation of the physical rather than the chemical properties of bitumens used in road construction and maintenance. The equipment consists of an extractor for separating bitumens and aggregates, an Engler viscosimeter, a penetration apparatus as well as appliances for determining melting point, volatilization, specific gravity, ductility, etc.

LABORATORY OF ONTARIO BOARD OF HEALTH

Through the courtesy of the Secretary of the Provincial Board of Health for Ontario the facilities of the excellently equipped laboratory which the Board maintains at Stanley Park have, with certain conditions, been placed at the service of the University for the investigation of problems of interest to the sanitarian and the sanitary engineer. The equipment consists of various types of sewage sedimentation tank, sewage filter, sewage measuring devices, aerators, sterilizing appliances and a complete and representative plant intended for the filtration and sterilization of water by practically all known methods.

CEMENT TESTING LABORATORY

This laboratory is fitted with all the ordinary moulds, sieves, balances, burettes, steaming and drying tanks, tables, and other appliances necessary in making the usual physical tests of a Portland cement. It is also supplied with completely equipped cabinets for individual work. In addition there are the following:

A 2,000 lb. Riehlé shot machine for tension.

A 2,000 lb. Fairbanks shot machine for tension.

A 1,000 lb. Olsen automatic shot machine fitted for tests in either tension or cross breaking.

An Olsen soapstone moist closet.

METROLOGICAL LABORATORY

The department of surveying and geodesy is provided with all the ordinary field instruments, such as transits, levels, compasses, micrometers, sextants, planimeters, plane tables, tapes, chains, etc., with which is carried on the instruction in practical field operations as detailed elsewhere.

A small laboratory is also established in the basement of the observatory described below, containing the necessary instruments for the refined measurements of geodetic surveying; as, a standard yard and metre, a Rogers 10-foot comparator, an invar base measuring apparatus, a Kater's pendulum with vacuum chamber, a level trier, micrometer microscopes, etc.

The geodetic observatory in connection with this department is used for the instruction of students of the Fourth Year in taking observations for time, latitude, longitude, and azimuth by the precise methods used in connection with a geodetic survey. It contains a 10-inch theodolite and zenith telescope by Troughton & Simms; an astronomical transit instrument and an 8-inch theodolite by Cooke; two electro-chronographs; a Howard astronomical clock; a Dent sidereal clock; a Dent sidereal break-circuit chronometer; a wireless receiving instrument; arithmometers, etc.

GEOLOGICAL AND MINERALOGICAL LABORATORIES

In the Chemistry and Mining building on College Street the University possesses a modern laboratory for Geology and Mineralogy.

Courses are given in laboratory work, especially in personal examination of type sets of rocks, fossils, minerals and crystal models. These laboratory exercises serve to illustrate the introductory didactic instruction.

For the encouragement of pure crystallography the laboratories are supplied with goniometers of the various types, crystal models, appliances for the cutting of oriented crystal sections and for the physical examination of the same. Practical petrography is carried on in rooms provided with type sets of rocks, both macroscopic and microscopic. Advanced students are taught to make thin sections of rocks and fossils and to study them microscopically. For students in Mining a laboratory course in the interpretation of geological maps and sections is provided. Typical mining regions are studied in detail and an opportunity is afforded for the examination of specimens illustrating economic geology.

The laboratory for the preparation of thin sections of rocks, minerals and fossils is provided with electric diamond saws and grinding appliances for the various types of work incidental to the preparation of thin sections and museum material.

A room is also provided for advanced work in cartography and geological surveying.

The departments possess 40 petrological microscopes and 10 of other types, so that it is now possible to provide advanced students with instruments and sets of thin sections for their own especial use. The blowpipe laboratory contains 156 lockers, especially designed for apparatus for students. Provision is made for the study of opaque minerals in reflected light.

LIBRARY

The University Library is contained in a building of its own, situated on the east side of the campus, that lies to the south of University College. All students who have paid a library fee to the Bursar of the University are entitled to the privileges of the Library. Besides Reading Rooms the Building contains Departmental Studies, which may be used as study-rooms by honour students in the various branches and in which the Professors hold seminary courses, and private studies, intended for members of the Faculty or advanced students engaged in research work. The Library is opened at 8.45 every morning and remains open until 10 at night during the academic term. Books in ordinary use may not be taken out of the building during the daytime, but are lent for the night towards 5 p.m., to be returned the following morning before 10 o'clock. Books not in general demand may, on special application, be borrowed for a longer period.

Failure to return a borrowed book at the proper time and other breaches of the regulations are punishable by fine or suspension from the privileges of the Library.

Rooms have been set apart in the Engineering, Mechanical, Chemistry and Mining and Electrical buildings for the housing of such periodicals and other literature of the University Library as is of special interest to the students of this faculty.

ROYAL ONTARIO MUSEUM

ARCHAEOLOGY, GEOLOGY, MINERALOGY, PALAEONTOLOGY, ZOOLOGY

Students of the University in all departments are recommended to avail themselves of the privileges of the Museum, which, although under separate control, is intimately connected with the work of the University.

The Museum is open on all week days from 10 a.m. to 5 p.m., and on Sundays from 2 p.m. to 5 p.m. The admission is free to the public on Tuesday, Thursday, Saturday and Sunday. On other days an admission fee of fifteen cents is charged.

By a resolution of the Board of Trustees all regular students of the University may be admitted free on all days of the week by presenting their card of registration.

UNIVERSITY OF TORONTO C.O.T.C.

The Toronto Contingent of the Canadian Officers Training Corps was organized in 1914, and is a unit of the non-permanent Active Militia. Its primary object is to provide students at Universities with a standardized measure of military training with a view to their qualifying for commissions in the country's auxiliary forces. C.O.T.C. Certificates of qualification exempt their holders from examination for commissioned rank on joining a militia unit in Canada, or, if resident in the British Islands, render them eligible for commissions in the Army Reserve of Officers, the Militia, or the Territorial Army.

The facilities which are offered by the contingent for obtaining a qualification while at the University, are intended to enable young gentlemen to give personal service to their country with the least possible interference with their civil careers, to ensure that units have their establishments complete in the junior commissioned ranks, and to build up an adequate reserve of scientifically trained officers who have completed a period of consecutive and systematic military training, on academic lines, of a nature calculated to produce good officers.

The contingent provides the practical work for students taking the Military Studies option for the Arts degree, as also physical exercise for students who may choose this as the form in which they will take their compulsory Physical Training. In addition to service in the corps for a University credit, students of any year or Faculty are trained in it to qualify for officers' certificates in the Artillery, Infantry, Engineers, Army Medical Corps and Signallers, writing on the examinations set by the War Office for members of O.T.C. contingents throughout the Empire.

There are at present four companies—in the Faculties of Arts, Medicine and Applied Science—and the training of each is so arranged that on leaving the University students are qualified for commissions in that branch of the Militia to which their University course particularly applied.

The present Headquarters are at 184 College Street, and include armouries, members' reading room, library, and lecture rooms.

The Contingent's Staff is:

Officer Commanding..........................Lieut.-Col. T. R. Loudon
Second in Command........................Major J. R. Cockburn, M.C.
Adjutant....................................Capt. W. S. Wilson
Paymaster......................................Capt. T. A. Reed
Contingent Sergeant-Major.... S-M. W. Hunt, late Royal Welch Fusiliers.

Officers of "C" (Applied Science) Company:

Officer Commanding.....................Capt. W. J. T. Wright, M.B.E.

SOCIETIES

THE ENGINEERING SOCIETY OF THE UNIVERSITY OF TORONTO

The Society meets during the academic year (except April), beginning with the third Monday in October. Addresses are given by prominent men on subjects of general interest.

The Society is divided into six clubs for the purpose of affording a medium of study of matters relating in particular to different branches of Engineering. Each of the Clubs holds its meetings at regular intervals. Papers are read and discussions held on engineering subjects.

The Society publishes an annual, called "Transactions," which contains the addresses given at the meetings and an account of the year's activities.

A Supply Department is conducted by the Society on a co-operative plan, through which instruments, draughting supplies, stationery, etc., can be purchased at a low cost.

ATHLETIC ASSOCIATION

The Athletic Association has full control over all athletic clubs using the name of the Faculty of Applied Science. The Executive Committee has power to suspend any one from the privileges of membership in the Association for any breach of its regulations, and controls the finances of all athletic clubs in the aforesaid Faculty. The annual membership fee of this Association is two dollars.

No other moneys are collected for the support of athletics in the Faculty of Applied Science without the sanction of the Executive Committee.

DEBATING CLUB

The Debating Club exists for the purpose of helping students to overcome their natural embarrassment when speaking in public and to that end holds weekly meetings during both terms, at which open debates take place after the manner of the Oxford Union.

THE INDUSTRIAL CHEMICAL CLUB

The object of the Chemical Club is to promote the study of industrial chemistry and chemical engineering. Illustrated lectures, preceded by an informal dinner and a short musical programme, are held fortnightly, and on the following day an excursion is made to industrial concerns located in the city or vicinity.

MECHANICAL ENGINEERING CLUB

The Club meets during the academic year for the discussion of papers relating to mechanical engineering problems.

ELECTRICAL ENGINEERING CLUB

The Club meets during the academic year for the discussion of papers relating to electrical engineering problems.

CIVIL ENGINEERING CLUB

The Club is addressed during the academic year by practising engineers on modern methods and problems in civil engineering.

MINING AND METALLURGICAL CLUB

The Club is the official organization representing the undergraduates of Departments 2 and 8 of the Faculty of Applied Science.

The objects of the Club are to promote the spirit of good fellowship and mutual assistance amongst its members, both graduate and undergraduate, to provide a means of meeting together, and for the discussion of pertinent topics.

ARCHITECTURAL CLUB

The Architectural Club is addressed during the academic year by Architects and others on the latest works and developments in their profession.

STUDENT CHRISTIAN ASSOCIATION

The Student Christian Association carries on the work commenced by the Young Men's Christian Association in this Faculty in 1905. The aims of the Association are to develop true Christian manhood and to be of assistance to students.

The Association conducts bible study groups and lecture courses, as well as arranging conferences through the medium of the Office in Hart House, which it helps to maintain. As well as this Office for the Director, the Rev. F. J. Moore, the men's Associations maintain a library.

LODGING AND BOARD

Accommodation is readily obtainable in numerous private boarding-houses within a short distance of the University, at a cost of from ten dollars a week upwards and board obtained separately at about seven dollars per week. A list of accredited boarding-houses is kept by the Secretary of the Students' Administrative Council in Hart House and students are recommended to consult him with reference to the selection of suitable accommodation.

UNIVERSITY RESIDENCES

By the generosity of the late E. C. Whitney, Esq., Mrs. Whitney and friends, the University offers to one hundred and fifty men the advantages of residential life and excellent accommodation within its own grounds. The Residence consists of three Houses situated on the north side of Hoskin Avenue, opening upon a quadrangle, the fourth side of which is formed by Devonshire Place. They stand about two hundred yards to the north of University College and close to Hart House. The buildings are known as the South, East and North Houses.

Each House contains twenty-four single rooms, one single suite, and eleven suites, a suite comprising a study and two bedrooms. Two large rooms in each building each with an open hearth have been set aside as a common rooms. A lavatory, with hot and cold shower baths is provided for every eight men. The buildings are heated by steam and lighted by electricity.

The University supplies the table, chairs, book-case, chiffonier, bed, mattress, pillows, linen and window shades for each room; it is prepared to furnish a desk lamp for a nominal rental.

The rates are $4.00 per week for a single room or half of a suite, and $5.00 per week for a single suite. The rent is payable as follows: For the Michaelmas Term, when the key is issued; for the Easter Term up to April 1st, at the opening of the Easter Term; for the remainder of the Easter Term, April 1st. These charges cover heat, light, house-service and house-laundry. No rent is charged for a room during the Christmas vacation unless it is occupied. For this reason the University reserves the right to use during that period any unoccupied rooms. To cover local telephone service each student in residence will be required to pay the Bursar an Annual Fee of $2.00. There is no separate dining hall connected with the Residence, but board may be obtained at the adjacent University Dining Hall in Hart House.

Except under very special circumstances occupants who withdraw at any time during the session will be required to pay the full rent up to April 1st.

Applications for rooms must be made in writing to the Secretary of the Residence Committee (address the Registrar's Office) and must be accompanied by a deposit of $5.00. This deposit will be returned if the application be not granted, and will be forfeited if a room is assigned to the applicant and not taken by him, unless notice of his refusal of the room be received by the Secretary in writing before September 15th. It will be returned in full at the end of the College year if the room key be given back and the room and furniture left in a satisfactory condition. The following principles govern the allotment of rooms: (i) No student who, as a result of the annual Spring examinations, is not assured of being able to proceed regularly to the higher year in the course in which he is enrolled will be admitted to Residence only under exceptional circumstances. Exception to this rule will be made in the case of a student in the Faculty of Medicine who has obtained standing at the May examination, but is debarred by the rules of that Faculty from proceeding to the subsequent year until he has passed his Supplemental examinations. Such a student will be assigned a room provisionally, but cannot occupy it unless he passes his Supplemental examinations in September. (ii) The rooms in each House will be distributed among the various Faculties and Years. (iii) A limited number of rooms will be reserved for members of the incoming First Year until September 12th. (iv) Applications will be considered in order of priority.

The University lays down three general rules, designed to prevent hazing, the use of intoxicants and gambling. The students in each House shall elect a House Committee, which is entrusted by the University with the making and enforcing of any other needed rules and with the maintenance of order. A member of the Faculty resides in each House to act as friend and adviser to the men in residence.

SUMMARY OF STUDENTS REGISTERED

SESSION 1928-1929

Year	1	2	3	3*a*	4	6	7	8	8*a*	Total
I	22	37	35	—	15	45	46	4	—	204
II	16	23	32	—	11	40	40	3	—	165
III	16	16	18	6	6	30	32	3	4	131
IV	13	9	22	—	12	17	21	3	3	100
	67	85	107	6	44	132	139	13	7	600